# The Belugas (*Delphinapterus leucas*) of Northern Quebec: Distribution, Abundance, Stock Identity, Catch History and Management

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# THE BELUGAS (Delphinapterus leucas) OF NORTHERN QUEBEC: DISTRIBUTION, ABUNDANCE, STOCK IDENTITY, CATCH HISTORY AND MANAGEMENT

by

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This is the 150th Technical Report
from the Western Region, Winnipeg

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## PREFACE

This report is submitted in fulfillment of two contracts from the Government of Canada. The first contract (No. 1SZ80-00050) from Supply and Services Canada was awarded to Makivik Corporation, Fort Chimo, P.Q. for 'Studies on the distribution, population size, stock identity and Inuit use of the white whales of northern Quebec.' This contract resulted from an unsolicited proposal by Makivik and LGL Ltd. and also received funding by Department of Fisheries and Oceans, and Department of Indian Affairs and Northern Development. The original Scientific Authority was Dr. J. Boulva of DFO. The current Scientific Authorities are Drs. T.G. Smith and A.W. Mansfield, DFO.

The second contract reported here is a 'Survey of white whale overwintering areas in northern and northwestern Hudson Bay'. It was awarded by Department of Fisheries and Oceans, Western Region, Winnipeg to LGL Ltd., Toronto. The Scientific Authority is R.F. Peet.

The opinions of this report are those of the authors and are not to be taken as the policy of the Department of Fisheries and Oceans.

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## ABSTRACT

Finley, K.J., G.W. Miller, M. Allard, R.A. Davis, and C.R. Evans. 1982. The belugas (Delphinapterus leucas) of northern Quebec: distribution, abundance, stock identity, catch history and management. Can. Tech. Rep. Fish. Aquat. Sci. 1123: v + 57 p.

Landed catches of belugas reported by the Inuit of arctic Quebec have averaged over 500 per year during 1975-79. This large kill and the absence of information about population size(s) prompted the present study.

Our summer aerial surveys in 1980 accounted for only 208 belugas in coastal areas; the largest group (about 149) occupied the mouth of the Nastapoka River along the east coast of Hudson Bay, and a smaller group (about 25) occupied the mouth of the Mucalic River in Ungava Bay during late July and early August. The belugas persisted in using the river estuaries despite considerable disturbance by hunters. The use of certain estuaries by belugas appears to be very traditional and the presence of many females with newborn calves indicates that these estuaries are important in the reproductive scheme of the belugas.

Aerial surveys of the Hudson Strait coast from September to late November found most belugas near Cape Hopes Advance. Shore-based observers at Cape Hopes Advance counted 4204 belugas passing by, primarily during November, whereas observers farther west near Wakeham Bay saw only 161 belugas up to 5 November. Movements of belugas at Cape Hopes Advance were thought to be local, possibly related to feeding, and some animals were likely counted more than once. A net westward movement past Cape Hopes Advance of about 2500 belugas is not easily explained, especially when there is no evidence of any movement farther west. There may be a clockwise movement near the Cape.

Belugas were found widely distributed in the offshore pack ice of Hudson Strait and Ungava Bay in late March 1981; 8940 belugas were estimated to be present in the area. Very few belugas were seen in northern and northwestern Hudson Bay, where west Hudson Bay belugas had previously been thought to winter. The wintering population of belugas in Hudson Strait must consist primarily of animals that migrate to summering areas in western Hudson Bay.

The sex ratio of belugas sampled at Inuit hunts was 1:1. Testis weights were found to increase abruptly after belugas reach a length of 330 cm and an age of 17 to 21 dentine layers. Females larger than 300 cm (about 13 dentine layers) had attained maturity. Females with newborn calves were taken in estuaries in summer, and pregnant females were taken in autumn at Quaqtak.

Morphometric analyses showed sexual dimorphism, but summering belugas from northern Quebec could not be distinguished from belugas taken in autumn in Hudson Strait on the basis of body size. Age-length and girth-length data demonstrate that belugas summering in northern Quebec and those wintering in Hudson Strait are similar to those summering in western Hudson Bay, but smaller than those summering in Cumberland Sound.

Present hunting patterns in northern Quebec involve three stocks of belugas:

1. A transient stock of about 8000-9000 animals that winters in Hudson Strait and Ungava Bay and migrates to summering areas in western Hudson Bay. The annual catch by four communities along the south coast of Hudson Strait ranged from 137 to 315 animals between 1975 and 1979. This stock is also hunted by communities on southern Baffin Island, Southampton Island and in western Hudson Bay.
2. A summer-resident stock in Ungava Bay. This stock is severely reduced (less than 100 animals) from historic levels and is presently heavily hunted by Fort Chimo and George River hunters. The annual catch reported by five settlements in Ungava Bay ranged from 38 to 194 between 1975 and 1979. These animals are taken primarily during July and August. Stocks (1) and (2) probably mix in winter in Hudson Strait.
3. A stock that summers along the east coast of Hudson Bay. This stock is severely reduced (to a few hundred animals) from historic levels of possibly 5000 animals. It is hunted primarily from the communities of Great Whale River and Inukjuak. The annual catch of three settlements (exclusive of Povungnituk) on the Eastmain ranged from 122 to 181 between 1975 and 1979, and is taken primarily during July and August. Stock (3) may mix with stocks (1) and (2) in winter.

The two stocks that summer in northern Quebec have been seriously depleted and present levels of hunting appear to threaten their survival. The core reproductive components of these groups apparently depend on limited and specific habitat, the estuaries of the Mucalic and Nastapoka rivers. Hunting occurs at both locations and both estuaries may also be affected by Hydro Quebec's plans for damming and diversion of rivers in northern Quebec. A cooperative approach to management of these stocks is discussed.


Key words: white whales; behaviour; arctic Quebec; aerial surveys; harvesting; stock assessment; population structure; sex ratio.

## INTRODUCTION

The beluga or white whale is a small toothed whale that occupies a discontinuous circumpolar range in arctic and subarctic waters. During the summer belugas are conspicuous in coastal areas, particularly around river mouths in certain areas of the Canadian arctic. The use of specific coastal areas by belugas is traditional and well known for most populations. Studies have been conducted on most of the summer concentrations of belugas in the Canadian arctic, and the size and status of four populations have been generally defined. These include

1. A population of about 6000-7000 belugas that migrates into the Beaufort Sea from the west and which concentrates at the mouth of the Mackenzie River in mid-summer (Fraker and Fraker 1979).
2. A high arctic population of about 10,000-12,000 belugas that migrates westward into Lancaster Sound and concentrates in the coastal waters of Somerset Island and western Baffin Island (Finley 1976; Davis and Finley 1979).
3. A remnant population of about 500-700 belugas that summers in Cumberland Sound along southeast Baffin Island (Brodie 1971; Brodie et al. 1981).
4. A population roughly estimated at 10,000 belugas that summers along the west coast of Hudson Bay, concentrating in the estuaries of the Nelson, Churchill and Seal rivers (Sergeant 1973).

Very little is known about the wintering grounds of these populations but clearly the Mackenzie population of belugas is separated from the populations in the central and eastern arctic. The high arctic population is thought to winter in West Greenland (Davis and Finley 1979). Based on measurements of body size and from tag returns, Sergeant and Brodie (1969) and Sergeant (1973) concluded that belugas from western Hudson Bay wintered in northwestern Hudson Bay and were effectively reproductively isolated from belugas in Cumberland Sound. The winter range of the Cumberland Sound population is not known.

Little account has been given to the belugas known to inhabit the coastal waters of Ungava Bay and eastern Hudson Bay in the summer. Sergeant and Brodie (1975), in their review of Canadian beluga populations, noted only that belugas occurred along the east coast of Hudson Bay and that up to 1000 belugas had been seen in Ungava Bay at one time. Historically, the east coast of Hudson Bay (the Eastmain) was known to support a large beluga population and there was a major whale fishery on the Great Whale and Little Whale rivers (Francis 1977). A partial survey of this area in 1978 found only a few hundred belugas (Breton-Provencher 1980).

Recent studies of the harvest levels of marine mammals by the Inuit of arctic Quebec revealed that large numbers of belugas are taken annually. Landed catches in arctic Quebec have averaged over 500 belugas per year during the period 1975-79 (NHRC 1975, 1976; Boulva 1981). Concern about these large kills from populations that were so poorly known led the Scientific Committee of the International Whaling Commission to recommend in July 1979 that 'Canada be requested to initiate research to determine the identity, size and status of the population of white whales along the Quebec coast of Hudson Strait from which very large catches are reportedly being taken.' Because of the significance of belugas in the subsistence economy of arctic Quebec, the Northern Quebec Inuit Association (NQIA) has also expressed concern about the long-term viability of the beluga harvest and about some of the issues raised by the International Whaling Commission.

There is also concern about the effects of hydro-electric developments on beluga populations. Nearly every river that flows into Hudson Bay and is used by summer concentrations of belugas will be affected by developments planned by Hydro-Quebec and Manitoba Hydro. Rivers such as the Nelson, Churchill, Great Whale, and Nastapoka have been, or will be, either dammed or diverted. The effects of these projects on the suitability of the estuaries for belugas are unknown.

The above concerns and knowledge gaps led Makivik Corporation and LGL Limited to propose a study of beluga populations of arctic Quebec. Support for the project was received from the federal departments of Supply and Services, Fisheries and Oceans, and Indian Affairs and Northern Development. The biological objectives of this study were to determine the size, distribution, movements and critical habitats of the population of belugas that is being harvested by the Quebec Inuit. In addition, a history of exploitation of belugas has been reconstructed from archival material in order to provide a historical perspective on population size and trends.

## METHODS

### STUDY AREA, TOPONYMY AND TERMINOLOGY

The study area encompassed the entire coast of Quebec (3100 km) from southern Hudson Bay to the northwest corner of Ungava Bay (Fig. 1).

In the past decade place names in northern Quebec, reflecting political vagaries, have undergone considerable change. The resulting confusion is evident on recent maps of the area. For example, George River, Payne Bay and Wakeham Bay were renamed Port Nouveau Quebec, Bellin and Maricourt, respectively, in the 1970's but more recently became Kangirsualudjuak, Kangirsuk and Kangirsujuak, respectively, which roughly translated are variations of Big Bay. This, combined with variations of Big River (Kuudjuaq, Kuudjuarapik), can cause much confusion. Thus in this report we maintain traditional geographical names (Fig. 1), most of which date from the mid-1800's and reflect the occupation of northern Quebec by the Hudson's Bay Company (Appendices 1-12). We have, however, adopted the more appropriate spelling of Quaqtak rather than Koartac and we use Inukjuak rather than Port Harrison. Also for brevity we refer to the east coast of Hudson Bay as the Eastmain, a traditional designation (cf. Francis 1977).

In this report the indigenous people of northern Quebec are referred to as Inuit, a self

appelation which has more recently taken precedence over the traditional 'eskimo' or 'esquimaux'. Beluga is a widely recognized folk name that in this report takes precedence over descriptive scientific nomenclature--white whale. In the appendices beluga is synonymous with porpoise, whale, white fish and white whale.

## ICE CONDITIONS

The distribution and movements of belugas are greatly influenced by ice conditions which in turn are determined by prevailing winds, currents and temperature. Generally the patterns of ice formation and dispersal are well known and predictable.

In spring, prevailing winds cause the ice to clear first from the north side of Hudson Strait. The ice packs against the south shore and into Ungava Bay. Solid ice usually remains in protected bays until June and pack ice is usually present along the coast of northern Quebec until mid-July or later. Ungava Bay is the last area to clear of ice; in 1980 a narrow belt of pack ice remained along the southwest coast of Ungava Bay until late July. The east coast of Hudson Bay was mostly clear of ice by mid-July.

Small amounts of 'slob' ice began to form in coastal areas of Ungava Bay and Hudson Strait by early November of 1980 but the sea remained nearly ice free until after 23 November when cold temperatures brought about extensive ice formation. Solid ice covered most bays and coastal areas of northern Quebec by November and by early December extensive fields of thin pack ice covered much of Hudson Strait.

Sea ice attains its maximum extent during March, at which time Hudson Strait and Ungava Bay are largely covered by pack ice in restricted motion. Due to prevailing NW winds, the pack ice tends to drift against the south shore of Hudson Strait and leads are most likely to be found along the lee shore of southern Baffin Island (Crane 1978). This pattern was evident on NOAA satellite imagery from March 1981, however, the eastern half of Ungava Bay was notably more open than normal. Indeed the ice cover reported during aerial surveys of this area in late March was much less than in western Ungava Bay and Hudson Strait. Typically in March the ice cover in Hudson Bay is almost entire except for persistent flaw lead zones along the south coast of Southampton Island and in Roes Welcome Sound. Intermittent flaw leads also develop periodically, depending on prevailing winds, in zones between the solid coastal ice and the central core of pack ice in Hudson Bay.

## ARCHIVAL RESEARCH

Although not part of the formal study contract, we reconstucted the catch history of belugas in northern Quebec to provide insights into former population levels and traditional patterns of estuarine occupation. The voluminous archives of the Hudson's Bay Company (HBC), whose history in northern Quebec dates back to the 1700's, were perused. A complete catch record for the Ungava district was reconstructed to 1900; because of time constraints only an incomplete but representative account is presented for the period from 1900 up to 1939, the last year for which archive material is available from the HBC. We have relied on the account of Francis (1977) for statistics on the Eastmain whale fishery.

For the period between 1940 and the present we have examined the incomplete records of the R.C.M.P. game reports and have also consulted former HBC employees from northern Quebec.

## COMMUNITY CONSULTATION

One critical component of the study was an early consultation with the hunters of northern Quebec in order to explain the reasons for concern about belugas, the procedures to be used for the study and the potential implications of the findings. This need for communication with the resource user is imperative at a time when increasing controls have been brought to bear on the hunting activities of northern people and when the resource user has developed more political awareness. This part of the study is ongoing.

Discussions with the hunters were important in outlining the habits of belugas in northern Quebec in order to design the most efficient study approach. Strategic observation sites were chosen with the assistance of the hunters. A communication network along the northern coast of Quebec permitted rapid dissemination of information about observations of belugas. Finally an overview of beluga biology and habits in arctic Quebec was obtained during interviews and casual conversations with experienced hunters.

## SUMMER AERIAL SURVEYS AND SHORE-BASED OBSERVATIONS

Aerial surveys were conducted between 23 July and 1 August 1980--a period during which it was expected that the belugas would be concentrating in river estuaries. The survey covered all coastal areas and a special effort was made to cover certain rivers (Mucalic, Nastapoka, Little Whale and Great Whale rivers) that were known to be frequented by belugas in mid-summer (Fig. 2).

The survey aircraft was a deHavilland single piston-engine Beaver equipped with floats. Two observers, one in the front right seat and one in the left rear seat, recorded all observations of belugas onto audio tape. Observations of belugas included numbers, age structure, direction of movement, general comments on behaviour, and associated remarks about position and time of sighting, habitat, sea and ice conditions, and visibility. Concentrations of whales in river mouths were photographed on Ektachrome ASA 200 film with a vertically aimed, motor driven, Hasselblad camera (6 cm x 6 cm format) equipped with a 40 mm lens.

The height at which the survey was flown depended on sun angle, cloud cover and sea conditions, and varied from 150 m to 700 m. Air speed averaged about 210 km per hour. An attempt was made to fly only under ideal conditions, that is, high overcast with diffuse lighting and calm seas. Under ideal conditions it was possible to fly at an altitude of 500 m and detect all or nearly all belugas that were at the surface within 2 km of the aircraft, and detect (with the use of

binoculars) animals up to 5 km or occasionally farther away. Observations of seabirds on the water constantly provided important references of detectability. Survey conditions in each of the areas surveyed are shown in Fig. 2. Favourable weather in late July allowed us to conduct about half of our survey under ideal conditions, in other cases, local weather disturbances forced us to fly at lower altitudes with reduced visibility.

Ground-based verification of aerial surveys was obtained by observers at two strategic areas for belugas--the Mucalic River in Ungava Bay and the Nastapoka River on the east coast of Hudson Bay. The movements and numbers of belugas were monitored in the Nastapoka River during the period of 29 July to 8 August and at the Mucalic River from 28 July to 20 August.

Additional notes on the occurrence of belugas were obtained from pilots and a network of contacts in most of the coastal settlements.

## AUTUMN AERIAL SURVEYS AND SHORE-BASED OBSERVATIONS

Aerial surveys were conducted between 22 September and late November 1980 from a twin engine Aztec. These surveys were concentrated along the northern coast of Quebec bordering Hudson Strait (Fig. 3), where local hunters suggested that we could expect to encounter the major autumn migration of belugas. Additional observations of belugas were obtained by A.J. Gaston of the Canadian Wildlife Service during low level (45 m) seabird surveys conducted over offshore and coastal areas of Hudson Strait in early September (Gaston MS).

Persistent poor weather, primitive air strips and fueling facilities, limited daylength and limitations of the aircraft placed severe restrictions on our ability to conduct the autumn surveys in Hudson Strait and Ungava Bay. In fact we were unable to fully complete any of the autumn surveys due to some combination of the above mentioned factors and because of highly variable and rapidly changing local weather conditions. An additional frustration in our aerial surveys was the visual impediment imposed by the low wing and engine mountings of the Aztec aircraft. Forward visibility from the co-pilot's seat was particularly impaired and, when possible, the prime observer was instead placed in the rear seat closest to the coastline. A camera port in the Aztec was useful in obtaining vertical exposures of larger herds of belugas for the purpose of accurate counting. It was originally planned to use a Twin Otter for these surveys but limited funds made this impossible.

Aerial surveys in Hudson Strait were designed to provide 'near-instantaneous' coverage of the entire coastal area. This was to be complemented by continuous monitoring of beluga migration throughout daylight and twilight hours from two observation sites placed strategically on prominences overlooking Hudson Strait. The first of these sites, La Boule, located at 61°42'N, 71°56'W (Fig. 1), was occupied from 4 October to 5 November when severe weather and ice formation necessitated its closing. The second site, Cape Hopes Advance at 61°05'N, 69°33'W, was occupied from 14 October to 4 December (Fig. 1).

Observers using telescopes and binoculars conducted watches from elevations of 180 m (La Boule) and 60 m (Cape Hopes Advance) and recorded weather observations (including visibility and sea state) at regular intervals. Watches were sometimes suspended during periods of extremely reduced visibility caused by fog or blowing snow or conducted at lower elevations during periods of moderately reduced visibility. When belugas were sighted, their numbers and directions of movement were recorded. Other data including age and sex structure of herds, their distances from shore, and behavioural observations were recorded when possible.

## WINTER AERIAL SURVEYS

Aerial surveys were conducted between 14 March and 30 March 1981 from a deHavilland Twin Otter equipped with an Omega VLF Navigation System. These surveys were concentrated in Ungava Bay and Hudson Strait (Fig. 10); additional surveys were flown in northern Hudson Bay, particularly in the vicinity of Southampton Island and Roes Welcome Sound (Fig. 12). Most of the areas (92%) were surveyed between 22 March and 30 March 1981.

The surveys were usually flown at 150 m ASL; on rare occasions when low clouds and light fog were encountered the survey was flown as low as 20 metres ASL. Air speed averaged 259 km/h. Favourable weather occurred throughout the surveys, although occasionally visibility was reduced at certain angles of view by the sun's reflection on the water surface. Three observers, one in the co-pilot's seat on the right, one in the first seat behind the pilot on the left, and one in the second seat on the left, recorded all observations of belugas onto audio tape. Information on each sighting included numbers, group type, age structure, direction of movement, comments on behaviour, and associated remarks about position and time of sightings, habitat, sea and ice conditions and visibility. Observations of belugas within 800 m on either side of the aircraft were considered to be on-transect for purposes of density determinations. The transects were divided into 2-min (approximately 8.6 km) segments for the purpose of mapping beluga distribution and ice conditions (Fig. 10 and 11).

In Ungava Bay and Hudson Strait transects over offshore pack ice were flown systematically along longitudinal lines between the shores of northern Quebec and southern Baffin Island (Fig. 10). This survey provided about 6% (10,811 $km^2$) coverage of Ungava Bay and Hudson Strait. Transects were also flown along flaw lead zones between the pack ice and coastal fast ice areas bordering Ungava Bay and Hudson Strait. About 56% (1988 $km^2$) of this linearly-distributed feature was covered by our surveys.

Coastal transects in flaw lead zones were also flown around Mansel and Coats Islands, along the southern coast of Southampton Island and in Roes Welcome Sound. Offshore transects over pack ice were flown between Rankin Inlet and Coats Island (Fig. 12). This additional survey area covered 3998 $km^2$.

The data from the front observer and the primary left-rear observer were the main basis for density determinations and population extrapolations. However, animals missed by the primary left rear observer but seen by the secondary left rear observer were also considered. This tends to make the results from the left observers more comparable to those of the right front observer, who has an extended visual field and a longer period of potential visual contact with the animals. Densities of belugas were determined for coastal and offshore transects in the Ungava Bay-Hudson Strait area but only the densities from the linear offshore grid were used to estimate total numbers present.

## BIOLOGICAL SAMPLING AND MEASUREMENTS

Whenever possible measurements and biological samples were taken from belugas that had been killed by Inuit hunters. However, when large numbers of belugas were taken at one time it was not always possible to thoroughly sample them before they were butchered by the hunters. Highest priority was given to the collection of morphometric data. A form written in Inuktitut and English was designed to facilitate the collection of sampling and measurement data (Fig. 4).

Measurements taken included standard length; and blubber thickness. These were measured as shown in Fig. 4. Biological samples included jaws, reproductive organs, eyes and samples of stomach contents. Biological samples were usually frozen within 24 hours of collection, but when freezing facilities were not accessible samples were fixed in 10% formalin (most samples) or 70% ethanol (stomach contents and jaws). Other data recorded included the sex and colour of the whale, descriptions of wounds, scars or other markings, and (for females) whether the whale was pregnant, lactating, or accompanied by a calf.

## LABORATORY TECHNIQUES

### Age determination

Lower jaws were boiled for 20 min and all of the teeth on the side showing the least tooth wear were extracted and stored in a 1:1:1 mixture of glycerine, 95% ethanol and water. Two teeth, the 2nd and 5th tooth from the tip of the jaw, were selected for age determinations. These teeth were bisected longitudinally on a jeweller's slotting saw, and the cut surfaces were polished on emery paper. The sections were stained with haematoxylin and examined under a 10x binocular microscope using reflected light. The dentine layers were counted in each section. When there were discrepancies between readings from the 2nd and 5th teeth the counts derived from the tooth showing the least wear were used as final estimates.

Sergeant (1973) discussed dentinal layering in belugas and concluded that 2 dentine layers are laid down annually. Although this conclusion was accepted by Brodie (1971), he noted that there has been considerable controversy about the rate at which dentine is deposited in odontocetes. Ohsumi (1979), in a review of biological parameters in cetaceans, noted that 'there are problems regarding the accumulation rate of growth layers for the white whale'. Since the rate of dentine deposition is not known, in this study we have used dentine layers only as an index of relative age.

### Reproductive material

The epididymis was removed and testes were weighed to the nearest 0.1 g on a triple-beam balance.

Ovaries were fixed in 10% formalin and later examined macroscopically for the presence of corpora lutea and corpora albicantia. Ovaries were sectioned at 2-3 mm intervals and the greatest diameters of the corpora were measured.

# RESULTS

## SUMMER DISTRIBUTION AND NUMBERS

A total of 208 belugas were counted during the aerial surveys that covered all of the study area in late July (Table 1, Fig. 5). Most (149) of these belugas were found in the mouth of the Nastapoka River on the Eastmain. Only 42 belugas were seen in coastal areas of Ungava Bay. The distribution of all sightings is shown in Fig. 5.

## ESTUARINE BEHAVIOUR

The Nastapoka River on the Eastmain and the Mucalic River in Ungava Bay were identified by hunters as the main areas where belugas would likely be found during mid-summer. Consequently our efforts were concentrated on these two areas. The aerial surveys (Fig. 5) showed that these were indeed the two areas with the most belugas in the summer of 1980.

### Nastapoka River

The Nastapoka is a relatively small (average discharge 50 $m^3/s$) clear river that flows about 200 km from an inland plateau and drops 30 m abruptly over an escarpment within 1.5 km from the coast. The estuary of the Nastapoka is a small indentation along a long stretch of simple coastline--the Hudson Bay Arc. The estuary is clear and shallow (<5 m deep, with tidal fluctuations of 1-2 m); the substrate consists of sand, gravel and boulder rubble and appears barren of macrophyte communities. The estuary is sheltered from Hudson Bay proper by a chain of islands 6 km offshore. A surface temperature of 17°C was recorded in the Nastapoka estuary on 1 August, compared to average July and August surface temperatures of 5-7°C in adjacent waters of Hudson Bay (Barber 1968).

We do not know when belugas first arrived in the Nastapoka estuary but hunters from Inukjuak had killed 21 animals there before our arrival on 29 July. A photographic survey on 30 July showed 149 belugas in the estuary; many of these were adults in close association with neonatal calves and larger immatures (Table 2). In fact, 37 adult-filial associations were identified while only 19 large white adults showed no apparent association with immatures; these adults were thought to be males (Table 2).

Belugas were observed in or near the Nastapoka River on all but one of the 11 days that we

Table 1. Numbers of belugas observed during aerial surveys of the northern Quebec coast, July 1980.

| Area | Date of Survey | No. linear km | No. of individuals observed |
|---|---|---|---|
| Ungava Bay | | 1221 | |
| Mucalic River | 23 July | | 24 |
| Leaf River | 24 July | | 11* |
| False Bight | 24 July | | 3 |
| Whale River | 23 July | | 4 |
| Hudson Strait | | 627 | |
| Diana Bay | 30 July | | 4 |
| Eastmain | | 1485 | |
| Nastapoka River | 30 July | | 149* |
| Richmond Gulf | 29 July | | 11 |
| Eastmain other | 29 July | | 2 |
| All areas | | 3333 | 208 (0.06/linear km) |

* Aerial photographic documentation. See Table 3.

Table 2. Herd composition of belugas in the Nastapoka estuary, 30 July 1980.[1]

| | |
|---|---|
| No. adult-neonate associations[2] | 17 |
| No. adult-yearling associations[3] | 8 |
| No. adult-immature associations[4] | 12 |
| No. ad.-neo.-imm. triads[5] | (5) |
| Total no. adult-filial associations[6] | 37 |
| No. independent immatures[7] | 10 |
| No. independent adults[8] | 19 (3 groups) |
| No. unclassified individuals[9] | 41 |
| Total number in herd | 149 |

1 Herd composition determined from a series of aerial photographs (6 cm x 6cm format) taken at an altitude of about 250-300 m.

2 Measurements of 5 neonatal calves from the Nastapoka and Mucalic estuaries ranged from 153 cm to 173 cm or about 0.48-0.54 of the length of a mature female. On Ektachrome film, neonatal calves appeared pale grey and less than one half the length of the adults, which they closely attended. Most neonates rode in a typical hydrodynamic position behind the dorsal ridge of the adult.

3 We do not have measurements of yearling animals but Sergeant (1973) indicates a range in size of 191 to 198 cm for 3 yearling calves in western Hudson Bay. On film they appeared larger than half the length of the adult (although sometimes this was difficult to ascertain) and darker and more robust than neonates. 'Yearlings' were always in close attendance with an adult, although the closeness of the attachment was often less than with neonates. It is important to note that our classification for yearlings is not definitive and may include neonates.

4 Light-grey immatures of various sizes exceeding one half the length of the adult and showing an obvious attachment to an adult were classified in this category.

5 Occasionally adults were attended by a neonate and a large immature, which was presumed to be its previous calf of about 2-3 years of age. Animals in this category are also included in the first classification.

6 This classification includes all adults that were obviously attended by a calf.

7 Larger light grey animals that showed no association with adults. Usually these were found in small groups.

8 Adults that did not appear to be attended by immatures. In all cases these appeared as large white animals in tightly cohesive, isolated groups or pods. We believe that such groups are probably males as did Heyland (1974) who classified them as 'bachelor' groups.

9 Some animals were submerged or indistinct on the film and could not be classified.

were there (29 July-8 August), and casual observations indicate that the estuary is sometimes occupied at night. Whales were seen entering the river at dusk on 29 July and observers continued to hear them (vocalizations and splashing) after dark. Belugas were also heard in the river after dark at 23:00 EDT on 8 August. Occupation of the river by belugas was sometimes interrupted by hunters from Inukjuak. Whale hunting took place at the river on four days during the period 30 July-8 August. Belugas were taken at least as late as 23 August in the Nastapoka estuary.

Numbers of belugas observed daily in or just outside the Nastapoka estuary during the period 31 July-8 August ranged from 0 (7 August) to 100 (8 August). On 31 July, 40 belugas, including calves and neonates, entered the river in the morning and departed after one hour. On the morning of 1 August a small group of belugas was observed offshore, just west of the river mouth. This herd did not enter the river but remained outside the mouth of the river for at least 3 h. On 2 August several groups of whales entered the river throughout the morning and by 12:00 EDT there were at least 70 belugas in the river. Whales were present just outside the mouth of the river on the morning of 3 August, but none were observed entering the river. Belugas were heard in the river on 4 August but heavy fog prevented observations until 15:30. At that time approximately 20 belugas including several calves and neonates were in the river, but they dispersed 30 min later when hunters arrived in a Peterhead boat. Hunting activity was heavy on 5-6 August after the arrival of two speed boats from Inukjuak, and nine whales were taken outside the river mouth on 6 August. No whales were observed in the river on the following day, but approximately 100 whales were seen in the river on 8 August.

The length of the whales' occupation of the river was quite variable, and factors influencing the amount of time spent in the river were not identified. On 1 and 3 August whales were observed outside the river mouth, but they did not enter the river, at least during daylight hours. On 31 July about 40 whales entered the river but for only 1 h, whereas on 2 August about 70 whales occupied the river for most of the day.

Inuit state that whales enter the river on a rising tide and leave the river on a falling tide. This belief was generally but not entirely supported by our observations. The tide at the Nastapoka is moderate (1-2 m) and at no time during the period that we were there was the tide so low that belugas could not have entered the river. On 31 July whales entered the river on a rising tide, but left the river 1 h later, before the tide peaked. On 1 August, whales outside the mouth of the river failed to enter the river at all. On 2 August several groups of whales entered the river on a rising tide and left the river after the tide began to recede. On 8 August at 20:00 EDT about 100 belugas left the river on a rising tide, but were heard in the river again after dark 3 h later.

Attempts to monitor the activities of individual whales were frustrated by our inability to track individuals as they travelled about in groups. The movements of groups of whales could be followed even underwater in the clear Nastapoka, but it was difficult to follow individuals within these groups except for very short periods of time (<2 min).

The behaviour of groups of whales was generally characterized by an alternation of periods of relative inactivity with periods of erratic rapid movements with sudden changes in direction. During the motionless periods, the behaviour of whales seemed to range from 'resting' to 'playful'. Calves were frequently seen tail-lobbing, or swimming on their sides with one flipper out of the water. These behaviours were usually observed when whales were in fairly calm, shallow waters near the river mouth. Prolonged diving was observed only on 2 August in relatively deep (5 m) fast-moving water. On this occasion groups of whales were observed to 'swim in place' against a very strong current, and in contrast to behaviour at other locations in the river where whales spent a large portion of the time at the surface, these whales dove for lengthy periods, often diving and surfacing in synchrony.

An interesting social interaction was observed on 2 August. A group of 13 whales, consisting of six white adults, four grey immatures and three neonates, was first observed just west of the river mouth at 07:40 EDT. This group entered the river at 08:45. These whales remained near the surface of the water for the most part, in a calm shallow section of the river, milling about and frequently changing their direction of movement. However, during the period from 10:12 to 10:43 the group made two advances (each followed by a retreat) of about 750 m up the river. On the first advance the belugas stayed up-river for 3 min and then swam back rapidly with the current. On their second advance up the river (which took 10 min) the whales spent 6 min diving 'in place' in an area where the current was very strong. From this area they took 7 min to swim downstream to their former location.

At 10:55 the group began to swim slowly west, out of the river, and at 11:06 they began to swim more rapidly. At this time we noted that a group of about 35 belugas was rapidly approaching the estuary from the northwest. The speed of these whales was striking, and they surfaced every few seconds, 'porpoising' through the water. These two groups of belugas joined and entered the river mouth together at 11:15. During the next 20 min the whales made another movement upstream and spent about 10 min diving in place where the current was strong. At 11:47 another herd of about 20 belugas approached from the northwest, and again some whales left the river to join them outside the river mouth. After these whales entered the river the belugas remained in several groups; some made 'runs' upstream while others remained behind in the shallows. At 12:40 all of the whales left the river, but whales were observed in the river again at 13:30 and remained until at least 15:00.

While we were at the Nastapoka we witnessed responses by belugas to two types of disturbance, low flying aircraft and hunting activities. On 30 July, 149 whales in the river were disturbed by our survey aircraft (deHavilland Beaver). The whales retreated seaward but remained in the river when the plane landed on floats on the estuary at 08:45; when the plane took off at 09:00 and circled the river four times the entire herd left the

river. Whales were sighted again in the river 4 h later.

Whales were driven out of the river on several occasions by hunting activities. In general, the disturbance caused by hunting did not appear to prevent belugas from returning to the estuary except for relatively short periods of time. Approximately 40 belugas entered the river on the morning of 31 July, about 13 h after a lactating female was killed in the river. A small group of belugas in the river were unsuccessfully hunted at 07:30 on 5 August, 15 h after another lactating female had been shot. An unsuccessful hunt 8 h later resulted in the wounding of another whale, and 17 h later on the morning of 6 August nine whales were taken. About five whales entered the river 12 h after this major hunt and another whale was taken. However, no whales were sighted in the river on 7 August. Because this was the only day on which no belugas were recorded, it seems likely that their absence from the estuary on this date was related to the large take there on the previous day.

The clear, relatively shallow waters of the Nastapoka, and their frequent occupation by belugas, enable hunters at the Nastapoka to hunt with relative ease. Hunters equipped with several boats having powerful outboard motors can surprise belugas in, or drive them into, shallow water. Once the belugas are in shallow water (where they can easily be seen underwater) they are followed until they surface. Hunters from Inukjuak generally harpooned whales at the first opportunity (thereby attaching floats to them) and wounded or killed them during later surfacings. In this manner eight Inukjuak hunters in two speed boats and a freighter canoe took nine belugas at the Nastapoka in 1.5 h on 6 August. We did not observe any losses during the hunt.

Mucalic River

The Mucalic is a small clear river originating about 240 km inland from Ungava Bay. About 3.4 km inland from the coast, the river drops over a short set of rapids and the clear water mixes with very muddy estuarine water contained in a narrow (70-100 m) tidal channel. The water depth in the channel varies with the considerable tidal amplitude (10-14 m) of southern Ungava Bay. At extreme low tide, extensive boulder-strewn mud flats devoid of benthic fauna are exposed, and in places the channel can be forded by wading.

Measurements of turbidity depended on the degree of onshore winds and wave activity but generally the Mucalic estuary was very turbid. Sechhi disc readings varied between 0.5 and 1.5 m. Water temperatures depended on the degree of tidal mixing but varied between 12 and 18°C. The area around the Mucalic estuary is extensively shoaled with many reefs and small islands.

On 23 July as the tide was rising we observed a single beluga headed toward the Mucalic estuary during the first aerial survey of the area. At high tide 4 h later we found a group of 24 belugas in the narrow channel of the Mucalic about 500 m from the river rapids. The group was disturbed by the overflight (about 200 m ASL) of the Beaver aircraft, by the time of a second pass over the area, the animals had retreated down the channel and only 15 animals could be seen in the turbid water. Many in the group appeared to be adults with calves in attendance. At least four of the calves were thought to be newborn.

Observers were present at the Mucalic River for 20 days between 28 July and 20 August and belugas were seen on 12 of these days. On all except four of these 12 days, considerable disturbance to the belugas was caused by hunters in canoes pursuing the whales. Thus our observations of 'typical' undisturbed behaviour are limited.

The belugas were persistent in their attempts to move into the river mouth despite the considerable threat posed by hunters. This persistence was strikingly evident on 5 August. At 11:00 EDT, a group of 11 or 12 belugas was observed moving toward the river mouth on a high tide. From 11:05 until 11:25 this group was pursued vigorously by a hunter in a canoe; he fired approximately 10 shots at the belugas. We lost sight of the group and assumed that the whales had escaped offshore. At 16:30 we accompanied the hunter in his canoe and were surprised to find a group of about 15 belugas (presumably the same group seen earlier) about 1 km up the Mucalic River.

The fact that hunters choose to situate themselves at the Mucalic River is also testimony to a traditional preference of belugas for this particular river mouth. According to the hunters, the behaviour of the belugas is predictable--they begin their approach along the coast from the east following a narrow channel through shoal areas on a rising tide; during their departure they head eastward past certain points along the coast. In fact, three of the belugas captured at the Mucalic River were caught in small nets placed strategically along this departure route.

Our own observations corroborate this daily pattern of movement. On all occasions when we first detected belugas, they came from the east at or shortly after the lowest tide. Their movement was rapid and they surfaced regularly and frequently. At low tide, the belugas followed a channel across the extensive shoal area around the mouth of the Mucalic River. Here their progress toward the river appeared hesitant and they sometimes milled about and retreated. We only observed their undisturbed departure from the river on two occasions. In both cases, they began to move out of the river near the peak of high tide and moved eastward along the coast.

We believe that the belugas must have also used the Mucalic estuary during the night. Near dawn on 8 August an immature beluga was captured in a net near the Mucalic River as the tide was going down.

On only one occasion, 6 August, were we able to closely monitor the activity of an undisturbed group (about 17) of belugas in the Mucalic River. They arrived at the mouth of the river at 14:20 EDT about 2.5 h after low tide. The group remained at the mouth of the river, milling about for 20 min before they moved into the narrow river channel. It was apparent that several of them had been rolling in the bottom sediments as their sides and backs were conspicuously smeared with black mud. Their initial movements in the channel

were marked by hesitant advances and rapid short retreats and it was not until 15:11 h, after six retreats, that they advanced beyond 500 m from the river mouth. They then continued to move farther up the river channel, occasionally retreating, and advanced farthest at 17:00 when they were within 200 m of the rapids about 3 km from the mouth of the river.

During the period of rising and high tide from 15:11 to 17:58 on 6 August the group of belugas remained primarily in a 300 m length of the river channel, slowly advancing and retreating. Their activity was notably subdued, although some of the young animals engaged in brief playful pursuit, or body contact. Airborne vocalizations audible to us at a distance of about 50 m were few, and consisted of an occasional high whistle associated with exhalation and on three occasions a louder 'blat'.

Because of the turbidity of the river it was not possible to see the entire group at one time; however, several individuals and associations could be identified, and these accounted for a total of 16 or 17 individuals. Three white adults, possibly males, did not appear to have any association with any of the immatures in the group, although two of them kept in fairly close association with each other. It was noted that these independent adults tended to stay apart from the main group consisting of immatures and females with calves and almost invariably they followed the group in upriver movements and led them when they retreated. The main group consisted of grey immatures of various sizes and two females, one a light grey, accompanied by neonates. Another neonatal calf did not appear to have any association with any particular animal and by its erratic movements we believed that it had lost its mother. At least five individuals in the group could be identified by scars, particularly two of the adults that had notable notches on the dorso-posterior portion of their backs.

At about 18:00 on 6 August the tide began to recede from the high mark and at 18:30 the belugas began to retreat quickly. They reached the river mouth at 18:37.

Some evidence indicates that the Mucalic River was used by the same animals throughout the period that we were there. The similarity in the size and structure of the group on 5 and 6 August suggests that some if not all of the same individuals may have been present on both dates. On 5 August, when we encountered the group in the river, we did not have time for close scrutiny of the group but it was noted that there were three white adults that moved together, and a female with a neonate was seen. On 6 August several individuals were described and photographed. Of these, a female with a peculiar mottled neonate and a light grey immature with a crescent-shaped mark on its side were again seen closely on 17 August about 10 km from the Mucalic River where they were pursued by a hunter in a canoe. Then on 20 August a female beluga and her mottled neonate were killed near the Mucalic estuary. Photographs of this odd-coloured neonate could not be definitely matched with those taken on 6 August, but we believe that it was the same animal.

The belugas of the Mucalic River were subject to considerable hunting pressure by hunters from George River and Fort Chimo. During the 12 days on which we observed belugas, successful hunts occurred on three days, unsuccessful hunts on four days, and on four days there was no hunting activity; on one day canoes were seen in the estuary but it was uncertain whether hunting was occurring. On one of these days 6 August, we requested one of the hunters not to hunt in order that we might watch the belugas; his compliance allowed us our only complete day of observation of undisturbed behaviour.

On 5 August we observed a group of about 15 belugas easily avoid a single hunter by undertaking long dives and reappearing 500-800 m away. Although the belugas allowed the canoe to approach within about 50 m, they dove when it approached closer. They undoubtedly could keep track of the movements of the canoe since they invariably surfaced far from the source of disturbance. On this particular occasion, the hunter lost track of the belugas and was surprised when later in the day he found that the group had continued up the Mucalic River despite the disturbance. Again he tried to drive them in the narrow river channel by shooting into the water and racing back and forth in the river channel, but the belugas simply submerged, reappeared about 1 km away, and moved out the mouth of the river. Two or more canoes used in hunting belugas can be more successful since the animals are not allowed to surface as frequently and become exhausted. Once a whale is approached as close as possible the hunter attempts to wound it to slow it down. It can then be harpooned to avoid loss.

During our stay at the Mucalic River we sampled seven belugas taken in this manner. We were aware of at least seven other animals that had been taken in the same area.

In addition, whale nets were also employed by three different hunters at the Mucalic River. One of these hunters was successful in netting a female with a newborn calf and a grey immature on 8 August. The female, a light-grey individual, was captured with the newborn calf at 19:00 local time as the tide was beginning to drop. The calf had unblemished skin and still retained 4 to 5 cm of umbilical cord, indicating recent birth.

## AUTUMN MOVEMENTS IN HUDSON STRAIT

### Aerial surveys

Adverse weather conditions in Hudson Strait and the limited capability of the survey aircraft placed severe limitations on our autumn survey effort. Nonetheless, we did manage to cover the west coast of Ungava Bay and the south coast of Hudson Strait, at least in part, on 9 occasions from 22 September to 28 November (Table 3, Fig. 6). Low level seabird surveys of Hudson Strait, which were conducted during September by the Canadian Wildlife Service, provide additional details about the numbers and distribution of belugas (Table 3).

The majority (826 of 1207) of belugas recorded during the surveys were found near Quaqtak in early November (Fig. 6). This observation is in agreement with results from the shore-based camps and with radioed accounts by hunters along the Hudson Strait coast. The only other major group

Table 3. Numbers of belugas observed during aerial surveys of Ungava Bay and Hudson Strait, September-November 1980.

| Date | Area of survey | No. linear km | Visibility | No. individuals observed |
|---|---|---|---|---|
| 3-4 September | Hudson Strait* | 1378 | not given | 64 |
| 9 September | " | 1105 | " | 0 |
| 13 September | " | 771 | " | 0 |
| 19 September | " | 858 | " | 0 |
| 22 September | Fort Chimo-Wakeham Bay | 570 | Fair | 0 |
| 27 September | Wakeham Bay-Ivujivik | 380 | Fair | 0 |
| 17 October | Fort Chimo-Wakeham Bay | 570 | Fair-Poor | 0 |
| 22 October | Wakeham Bay-Sugluk Inlet | 265 | Excellent | 138 |
| 3 November | Fort Chimo-Deception Bay | 770 | Fair | 139 |
| 9 November | Fort Chimo-Cape Weggs | 705 | Fair-Excellent | 697 |
| 10 November | Quaqtak-Ungava Bay | 630 | Fair | 28 |
| 17 November | Fort Chimo-Wakeham Bay | 570 | Fair-Poor | 15 |
| 21 November | Fort Chimo-Quaqtak | 340 | Poor | 6 |
| 28 November | Quaqtak-Wakeham | 230 | Fair | 120 |
| Total | | 9142 | | 1207 (0.13/linear km) |

* Incidental observations of marine mammals were recorded during seabird surveys conducted by A.J. Gaston of the Canadian Wildlife Service. These surveys were generally flown at an altitude of 44 m.

of belugas found along the coast of Hudson Strait was a herd of 135 animals near Sugluk on 22 October. Coincidentally we encountered this group at the same time as did some hunters from Sugluk and later they reported this by radio. It was the only report of substantial numbers of belugas that we heard during radio conversations with hunters along the Hudson Strait coast in the autumn.

Scattered small groups of belugas were seen frequently at the entrances of Leaf Bay and Payne Bay, areas in which tidal currents were very strong. The area frequented by large groups of belugas on the east side of Quaqtak peninsula was also an area of strong tidal currents.

Few of the groups observed from the air showed any marked directional movement such as we have seen in migrating herds in the high arctic (see Davis and Finley 1979). The herd of 135 belugas seen near Sugluk was moving strongly eastward but was being pursued by hunters in motor boats. A herd of 120 belugas observed near Diana Bay on the last survey (28 November) was moving strongly east at a time when extensive ice cover was forming. The large numbers of belugas observed near Quaqtak in early November usually occurred in dispersed small groups that were apparently engaged in local movements (i.e. there was no overall coordinated movement) or possibly feeding (since some groups were attended by foraging seabirds).

With two notable exceptions, most groups of belugas seen during aerial surveys consisted of adults and immatures. On 22 October, the two aerial observers noted independently that the group of 135 belugas seen near Sugluk consisted entirely of white adults. Unfortunately this could not be verified by aerial photographs due to deteriorating weather conditions. On 9 November, two observers again noted a strikingly compact group consisting of adult belugas on the east side of the Quaqtak peninsula (Fig. 7). Examination of aerial photographs of the group of 356 confirmed that it consisted almost entirely of large white adults with no apparent adult-calf associations. We believe that these animals were probably males. Only 21 large immatures could be identified and these were interspersed throughout the herd in discrete groups of 2-4 individuals. The herd structure of this group is illustrated in Fig. 7. Nearby there were dispersed small groups consisting of adults with calves.

Shore-based observations

Belugas at Wakeham Bay: Migration watches were conducted near the community of Wakeham Bay at La Boule, on Hudson Strait, during the period 4 October-5 November. No watches were conducted on 7, 19 or 27 October when visibility was severely restricted by high winds and blowing snow. Fog or blowing snow sometimes reduced the number of hours during which it would have been possible to see migrating belugas. In total 268.5 hours of watches were conducted during periods when the visibility was such that observers were confident that they could have seen passing whales--an average of 8.1 h/day (Fig. 8).

Very few belugas were seen during the period of observation at Wakeham Bay and the nature of their movements did not reveal any major migratory tendency (Fig. 8). A total of 161 belugas were sighted. Ninety-one of these whales were moving east and 70 were moving west. Most of the animals were seen in small groups ranging in size from 1 to 20 individuals (average of 7), and most of these groups were making southwesterly movements into, or northeasterly movements out of, Wakeham Bay. Due to the difficulty in keeping track of these small groups, it was not possible to obtain a refined total count and it is probable that some animals were counted more than once. The largest groups of belugas, totalling 140 individuals, were observed during the last three days of observation in early November (Fig. 8). Again these movements appeared to be local involving small groups moving east and west with no apparent strong migratory tendency.

Belugas at Quaqtak: Migration watches were conducted from Cape Hopes Advance (5 km northeast of the community of Quaqtak) during the period 14 October-4 December. Severe weather greatly restricted visibility on 27 October and 30 November, but a total of 484 hours of watches with good visibility were conducted during the 52 day period (9.3 h/day, Fig. 9).

A single beluga was recorded on 25 October, but the first major movement was not recorded until 1 November when 116 westbound belugas passed the Cape (Fig. 9). Belugas were sighted on 30 of the 33 days of watches during the period 1 November-4 December. The largest recorded movement was on 11 November when 1616 westbound belugas passed the Cape. A total of 2556 belugas were seen to pass the Cape during the period 5-11 November and the great majority of these (all but 10) were moving west.

Daily movements were sometimes unidirectional (either east or west) but more often belugas were observed moving in both directions. Belugas moving west outnumbered whales moving east on 17 days; on 14 days eastward movements predominated. Most of the eastward movement occurred in late November. However, in terms of total numbers, whales moving west greatly outnumbered those moving east. Seventy-nine percent of 4204 belugas whose direction of movement was recorded were moving west. Subtracting the total number of eastbound belugas (879) from the total westbound (3325), we find a net westward movement of 2446 whales past the Cape during our watches.

Despite the recorded net westward movement of approximately 2500 belugas during our migration watches at Quaqtak, aerial surveys along the coast west of Quaqtak during this period provided few beluga sightings (Fig. 9). We suggest that the beluga movements observed from Cape Hopes Advance are local movements, perhaps from one feeding area to another, but the general westward nature of the observed movements remains unexplained. The pattern of movement contrasted with the marked eastward movement of bowheads and ringed, bearded and harp seals (see following section).

On 9 November, aerial surveys were conducted at the same time as shore-based observers were recording westward beluga movements past Cape Hopes Advance. The aerial survey crew recorded 534 belugas in one large and several small scattered herds among the Eider Islands in Ungava Bay at approximately 09:50. As the aircraft flew over Cape Hopes Advance at 09:55 EST the aerial observers noted that about 40 belugas in small groups had already passed the Cape. Belugas had been passing the Cape since at least 06:37 and shore-based observers had counted 91 by the time the aircraft flew over. None of these belugas were found in Diana Bay despite thorough coverage of that area and only the previously mentioned 40 belugas were found west of the Cape.

On the return flight (at approximately 15:30) across open water toward Cape Hopes Advance the aerial observers saw three belugas heading east about 5 km offshore, another three belugas 2-3 km offshore, and one adult about 1-2 km directly off the observation point. By this time shore-based observers at the Cape had counted 335 belugas heading west, and had seen none heading east.

About 10 km southeast of the Cape along the Ungava coast the aerial crew located a herd of 356 adults and approximately 100 other belugas just before dark. On the following day no movements were recorded past the Cape and an aerial survey provided sightings of only 15 belugas and 1 bowhead whale along the Ungava coast. It seems likely that the 455 belugas seen just before dark on 9 November moved past the Cape that night.

On 11 November, after a day with no recorded movements past Cape Hopes Advance, 1616 belugas (the highest count during the autumn period) were observed as they headed west past the Cape.

We can only suggest that there is a clockwise circulation of belugas in the vicinity of Cape Hopes Advance, and that most of the easterly movements of belugas were far enough offshore that they were not detected by shore-based observers at the Cape. The scant evidence supporting this is the aerial observations on 9 November of belugas travelling east several km offshore.

The age structure of passing herds of belugas was noted when possible. It should be noted that it was usually only possible to do this for small herds and the data may be biased for this reason. A total of 1113 belugas were classified in this manner. Observers may have experienced some difficulty in separating neonates from small immatures, and immature grey animals from mature grey animals. The adult category includes white and

Table 4. Relation between amount of ice cover and sightings of belugas in offshore areas of Hudson Strait and Ungava Bay.

| % ice cover | # 2-min segments with sightings | # 2-min segments without sightings | % 2-min segments with sightings |
|---|---|---|---|
| 0-5 | 0 | 0 | - |
| 6-25 | 0 | 7 | 0 |
| 26-50 | 2 | 18 | 10 |
| 51-75 | 26 | 78 | 25 |
| 76-90 | 75 | 215 | 26 |
| 91-99 | 46 | 311 | 13 |
| 100 | 0 | 3 | 0 |
| Total | 149 | 632 | 19 |

Table 5. Sex composition of belugas sampled at various Quebec locations in 1978 and 1980.

| | N | Males | (%) | Females | (%) | p[1] |
|---|---|---|---|---|---|---|
| 1980 | | | | | | |
| Nastapoka River[2] | 18 | 10 | (55.6) | 8 | (44.4) | 0.81 |
| Ungava Bay[3] | 12 | 5 | (41.7) | 7 | (58.3) | 0.77 |
| Quaqtak[4] | 30 | 15 | (50.0) | 15 | (50.0) | 1.00 |
| Total 1980 | 60 | 30 | (50.0) | 30 | (50.0) | 1.00 |
| 1978 | | | | | | |
| Great Whale[5] | 24 | 16 | (66.7) | 8 | (33.3) | 0.15 |

[1] p = two-tailed probability for the null hypothesis of a 1:1 sex ratio (binominal test).

[2] 30 July-23 August 1980.

[3] 7 August-20 August 1980.

[4] 4-25 November 1980.

[5] June-September 1978; sample includes whales taken in the region of the Great Whale River and Richmond (Breton-Provencher 1980).

large greyish-white animals, the immature category includes medium-sized and small grey animals, and the neonate category includes small grey or grey-brown animals less than half the size of the attending adult. In total 49.5% (551) of the whales were classed as adults, 36.1% (402) were classed as immatures, and 14.4% (160) were classed as neonates.

Belugas passing the Cape usually travelled singly, in pairs, or in small pods of 3 to 15 individuals. Sometimes larger loosely-knit herds of up to 50 belugas passed, but these herds appeared to be composed of smaller sub-groups. Nearly all of the herds we observed were made up of both adult and immature animals and many herds contained neonates.

There was no rigid daily pattern of movements past the Cape, but the largest movements were generally recorded in the morning rather than later in the day.

Other species: During the migration watches conducted at Cape Hopes Advance, movements of six other species of marine mammals were recorded. These species were bowhead and minke whales, ringed, harp and bearded seals, and walrus. The dates of these sightings and the directions of movement of the animals are shown in Appendix 14.

The movements of most of these species were predominantly east, although minke whales were frequently observed travelling east and west on the same day and their movements appeared to be primarily local. The overall eastward movement of most species contrasts with the behaviour of minke whales and belugas whose movements were thought to be more local, possibly related to feeding.

Bowheads (Balaena mysticetus) were sighted 22 times from 15 October to 23 November. Peak movements were on 20-23 November when 10 were sighted. Overall, fourteen bowheads were moving east and only one moved west (directions for seven bowheads were not recorded). A pair of eastbound bowheads were seen on 17 October; all others were travelling singly. No calves were identified.

Minke whales (Balaenoptera acutorostrata) were observed 74 times during the period. They were seen regularly from 16 October to 21 November, but none were recorded in late November or early December. Thirty-five sightings were of whales moving east and 27 were of whales moving west while others showed no obvious directional inclination. It is possible that many of these sightings involved the same individuals.

Fourteen ringed seals (Phoca hispida) were recorded from 16 October to 26 November. Eleven were moving east and three were moving west.

Harp seals (Phoca groenlandica) showed a strong eastward movement during the period of study; 263 were seen moving east during the period 19 October to 4 December, and only one was seen moving west.

Twenty-nine bearded seals (Erignathus barbatus) were seen moving east from 16 October to 4 December; only one westbound individual was seen.

One eastbound walrus (Odobenus rosmarus) was sighted on 3 December.

## WINTER DISTRIBUTION AND NUMBERS

Belugas were found widely distributed in the offshore pack ice of Hudson Strait and Ungava Bay in late March (Fig. 10). A total of 510 belugas (0.047/km$^2$) were seen on transects over offshore areas. Only 31 belugas (0.016/km$^2$) were seen along coastal flaw-lead zones of Hudson Strait and most of these were found in a small area near Ivujivik. In fact belugas showed a preference for areas with 50-90% pack ice cover (Table 4). General ice conditions in Hudson Strait and Ungava Bay are shown in Fig. 11.

Very few (20) belugas were seen in areas west of Hudson Strait (Fig. 12). Only one beluga was seen in the large flaw lead in Roes Welcome Sound, an area that was thought by Sergeant and Brodie (1975) to harbour most of the beluga population (roughly estimated at 10,000) from western Hudson Bay in the winter. Roes Welcome Sound contains the only significant area of open water in northwest Hudson Bay during the winter (Fig. 13). In most other areas, the ice was close packed with very little open water available. Most of the belugas seen during the western portion of our surveys were found in an area north of Mansel Island (Fig. 12).

Although belugas were distributed widely throughout the offshore pack ice of Hudson Strait, observations tended to be clumped locally (Fig. 10). Belugas were seen on only 149 (19%) of 781 transect segments that were surveyed. However, on 37 (25%) of the 149 segments with sightings, both left and right observers saw belugas. This clumping of belugas may be imposed in part by the restricted availability of open water amidst expanses of ice. However, belugas were not recorded in a large number of transect segments over similar habitat (Table 4); this suggests that the degree of clumping is related more to behavioural association of belugas, although the looseness of the association contrasts sharply with the highly gregarious behaviour of the belugas observed during the summer period.

Based on the recorded density of belugas (0.047/km$^2$) on our offshore transects, a total of 8940 belugas was estimated to be present in the area (190,210 km$^2$) of Hudson Strait and Ungava Bay bounded by the coastal fast ice and our survey lines (Fig. 10). This estimate is considered conservative since animals that were submerged or beneath the ice could not be accounted for.

## BIOLOGICAL PARAMETERS

### Sex ratio

The sex ratios of belugas sampled from the Inuit hunts at different localities are shown in Table 5. None of these ratios differ significantly from unity, and when the three samples are pooled the resulting sample consists of 30 males and 30 females.

Table 6. Reproductive condition of 25 female belugas taken on Eastmain, Hudson Strait and Ungava Bay in 1980.

| | Length (cm) | Number of dentine layers | Sexual[1] status | Pregnant | Recent[2] birth | Lactating | Number of corpora albicantia |
|---|---|---|---|---|---|---|---|
| Ungava | 153 | 1 | immature | - | - | - | 0 |
| Ungava | 241 | 4 | " | - | - | - | 0 |
| Quaqtak | 275 | 8 | " | - | - | - | 0 |
| Eastmain | 278 | 11 | " | - | - | - | 0 |
| Eastmain | 293 | 13 | "? | - | - | - | n.s. |
| Ungava | 305 | 14 | mature | - | - | n.e.[3] | 1 |
| Quaqtak | 305 | 14 | " | - | - | n.e. | 2 |
| Quaqtak | 309 | 13 | " | - | - | n.e. | 1 |
| Eastmain | 312 | 13 | "? | - | - | - | n.s. |
| Quaqtak | 315 | n.s.[3] | " | - | - | n.e. | 2[4] |
| Ungava | 318 | 16 | " | - | F (153) | + | 8 |
| Eastmain | 319 | 14 | " | - | - | + | 2 |
| Ungava | 320 | 17 | " | - | M (166) | + | 2 |
| Quaqtak | 320 | n.s. | " | - | - | - | 5 |
| Eastmain | 322 | 15 | " | - | - | + | 4 |
| Eastmain | 327 | 16 | " | - | - | + | 5 |
| Ungava | 329 | 17 | " | - | M (154) | + | 2 |
| Quaqtak | 329 | 19 | " | + | - | n.e. | n.s. |
| Ungava | 330 | 18 | " | - | - | + | 4 |
| Quaqtak | 333 | n.s. | " | + | - | n.e. | 1 |
| Eastmain | 335 | n.s. | " | - | M (156) | + | n.s. |
| Quaqtak | 340 | n.s. | " | + | - | n.e. | 8 |
| Quaqtak | 343 | n.s. | " | - | - | + | 7 |
| Quaqtak | 349 | 20 | " | + | - | n.e. | n.s. |
| Quaqtak | 377 | 30 | " | + | - | n.e. | n.s. |

[1] Females whose ovaries contained corpora lutea or albicantia were considered mature. When ovaries were not available for examination of pregnancy, evidence of recent parturition or lactation was considered to be evidence of maturity. Females that could not be classified according to the above criteria were considered mature if they were greater than 300 cm in length.

[2] Sex (M or F) and length in cm of any attendant calf is given. Some females listed here whose reproductive tracts were not collected may also have calved recently, but in the absence of substantive reproductive material we were unable to determine whether they had given birth.

[3] N.s. or n.e. indicate 'no sample' or 'not examined'.

[4] Only one ovary was examined for this sample; thus the number of corpora albicantia shown is a minimum figure.

In a sample of 24 belugas taken in the vicinity of the Great Whale River and Little Whale River, and in Richmond Gulf (Breton-Provencher 1980), the majority (16) were males. Although the sample size is too small for meaningful interpretation, Breton-Provencher (1980) suggested that there was selective hunting pressure for males, particularly during early July. During the weeks comparable to the sampling period at the Nastapoka River in 1980 (last half of July and all of August) fewer males than females were taken in the Great Whale region. Our data do not support the observation of Breton-Provencher that there is greater hunting pressure on males, but we did not obtain samples for the early July period.

Reproductive status

Testis weights (based on the weight of one testicle or the mean weight of two) were obtained from 17 belugas in this study. These data, along with data from Breton-Provencher (1980), are plotted relative to body length in Fig. 14. Combined, these data illustrate an abrupt increase in testis weight after the belugas reach about 330 cm in length. This increase corresponds closely with Sergeant's (1973) data from western Hudson Bay. The data indicate that the onset of sexual maturity occurs when males reach 330 cm in length. Belugas in this length range varied from greyish-white to white in colour.

Sergeant states that as testes attain a size of 200 g they are capable of sperm production. Using this criterion it is apparent (from Fig. 14) that some males in the 330-350 cm size range, and almost all males greater than 350 cm in length, are sexually mature.

Testis weights are plotted relative to the number of dentine layers (an index of age) in Fig. 15. Data from the Great Whale region (Breton-Provencher 1980) are also included in this figure. The youngest male with a testis weight over 200 g had 17 dentine layers; the oldest with a testis weight under 200 grams had 21 dentine layers. Sergeant (1973) found that western Hudson Bay belugas mature at 16-18 dentine layers, whereas Brodie (1971) found that in Cumberland Sound, all males with more than 14 dentine layers were mature. The relationship between number of dentine layers and age remains uncertain.

The reproductive conditions of 25 females are shown in Table 6. This analysis is based on the examination of 19 reproductive tracts (ovaries or uteri with attached ovaries) and gross field examinations of the reproductive condition of another six belugas. Belugas whose ovaries contained corpora lutea or albicantia were considered mature. Of the six belugas whose ovaries were not examined in the lab, those that were pregnant, lactating, or showed evidence of recent parturition were considered mature. For two belugas of intermediate length (293 and 312 cm) that could not be classified according to the above criteria, 300 cm was arbitrarily chosen as a dividing line between immature and mature belugas.Five females ranging in length from 153 to 293 cm and having from 1 to 13 dentine layers were considered immature. Twenty belugas (305-377 cm; 13 to 30 dentine layers) were classed as adults. Five (25%) of the 20 mature females were pregnant with fetuses conceived in 1980. All five of these pregnant females were among the 10 mature autumn samples taken at Quaqtak. At least four (20%) of the 20 mature females were accompanied by new-born calves ranging in length from 153 to 173 cm. All four of these were among the 10 mature females taken in estuaries during the summer.

Our data are too few to provide much evidence about the age of sexual maturity in females; however, our youngest female with ovarian corpora had 13 dentine layers. Those with 11 or fewer dentine layers had no corpora.

Sergeant (1973) found immature females with up to 13 dentine layers but he also found five young ovulating females with only 8-13 dentine layers. Brodie (1971) similarly found that the onset of sexual maturity usually occurred between 9 and 11 dentine layers, although he did find an atypical immature female with 15 dentine layers.

Morphometrics

Lengths of summering belugas from Ungava Bay and eastern Hudson Bay (Nastapoka) and autumn samples from Hudson Strait (Quaqtak) are plotted in Fig. 16. In addition the lengths of Great Whale River belugas taken in 1978 (Breton-Provencher 1980) have been included in this figure. The only obvious difference in the length frequencies of these samples is that the maximum length of males from each locality exceeded the maximum length of females. This sexual dimorphism is consistent with the findings of Sergeant and Brodie (1969) and Breton-Provencher (1980). No among-locality differences in lengths were evident for either males or females.

The relationship between length and number of dentine layers (an age indicator) is plotted in Fig. 17. These data do not reveal any differences between the summer estuarine samples, primarily from the Eastmain, and the autumn samples that are thought to represent belugas from western Hudson Bay (see Discussion). As expected the age-length data for males (Fig. 18) are not different from those of Breton-Provencher (1980). Most of the points fall between the growth curves for males from western Hudson Bay (Sergeant and Brodie 1969) and Cumberland Sound (Brodie 1971), however, there is more overlap with Sergeant's curve. Unfortunately detailed statistical comparisons of age-length data for these populations could not be conducted without access to the original data from western Hudson Bay and Cumberland Sound.

Regressions of girth on length have been plotted for western Hudson Bay (Churchill) and Cumberland Sound belugas (Sergeant and Brodie 1969) and are shown along with our data (Fig. 19). The regression lines show that, for belugas greater than approximately 220 cm in length, Cumberland Sound belugas are thicker bodied than Churchill belugas. Sergeant and Brodie (1969) attribute this more robust form to greater blubber thickness in the Cumberland Sound whales. Our data, with few exceptions, clearly fall along the Churchill regression line. Thus the whales that we measured have a body form similar to Churchill belugas, and distinctively different from Cumberland Sound belugas. We did not include data from Breton-Provencher (1980) in this figure because her points showed considerably more scatter than

ours. We calculated a mean condition index (100 x girth/length) for our Nastapoka samples (N = 18) of 55.6 ± SD 3.6. Breton-Provencher's similarly sized sample (N = 20) showed considerably more variation, 61.7 ± 12.39, which may reflect inconsistencies in measuring technique or problems encountered in attempting to measure partially butchered belugas.

Based on age-length and length-girth measurements it is apparent that northern Quebec belugas most closely resemble the western Hudson Bay population. Measurements from the summer resident populations of Ungava Bay and the Eastmain are not distinguishable from those of belugas taken at Quaqtak in autumn; the latter are thought to represent belugas that summer in western Hudson Bay (see Discussion).

## CATCH HISTORY

The following account of the catch history of belugas in northern Quebec is synthesized largely from the voluminous records of the Hudson's Bay Company whose history in northern Quebec dates back to 1750. Additional details are presented in Appendices 1 to 12.

### The 1700's

The natives of northern Quebec traditionally hunted belugas for food and oil. On the Eastmain, belugas were hunted when they entered estuaries in July and August. The hunt consisted of noisily driving the whales downriver into a line of canoes strung across the river's mouth or into shallows where they could be more easily harpooned. Five whales was considered to be a good day's catch (Francis 1977).

The Hudson's Bay Company's (HBC) first whaling venture on the Eastmain was initiated after they established Richmond Fort on Richmond Gulf in 1750 (Francis 1977). A whale fishery was operated on the Little Whale River and although both the traditional hunt and nets were tried, the operation was abandoned in 1759 due to its limited success. Two subsequent attempts to establish whale fisheries at the Great Whale and Little Whale rivers also failed.

### The 1800's

In the 1800's, the HBC established successful beluga fisheries at the Little Whale and Great Whale rivers on the Eastmain and at Fort Chimo in southern Ungava Bay. The Eastmain fishery briefly developed into a large scale operation.

In 1852, a HBC expedition sent into Hudson Bay to study the possibility of establishing whale fisheries reported the presence of thousands of whales at the Little and Great Whale rivers and farther north in Richmond Gulf and at the 'Nistabucky' (undoubtedly the Nastapoka) River. Governor Simpson had high expectations for whale fisheries in the bay, maintaining that it would rival the lucrative beaver trade in importance (Francis 1977).

In 1853 and 1857, the Little and Great Whale rivers fisheries were established, respectively (Francis 1977). Richmond Gulf had been investigated for the possibility of establishing a whaling operation but nothing became of this. In 1854 and 1856, the netted catches from the Little Whale River estuary were 423 and 743 belugas, respectively. In 1857 the take from the Great Whale River estuary was 1043 belugas. In 1858 and 1859 the whales deserted the estuaries. The greatest catch was made in 1860 when 1500 belugas were taken in the Little Whale River and 800 in the Great Whale River. The total catch from this heavy exploitation was 4509 belugas in seven years. Breton-Provencher (1980) estimated that the initial population must have been at least 3500 belugas to allow for the take of 4509 animals in seven years. This estimate was based on an assumed annual production rate of 8%. However, when natural mortality, hunting losses and the regular native harvests are considered, it seems likely that the initial population was substantially larger. In the period 1861 to 1869, commercial harvests were unsuccessful. Francis (1977) states that the lack of success occurred because belugas deserted the estuaries but it is likely that the population had been severely depleted during the 1854-60 period. The commercial operations on the Little Whale and Great Whale rivers were abandoned in 1869 (Francis 1977).

The HBC established the Fort Chimo post on the Koksoak River in 1830 to open a trade with the Inuit inhabitants of Ungava Bay, Hudson Strait and Labrador. One of the first accounts of the prospects for the beluga fishery in Ungava Bay was described in the Fort Chimo logbook on 3 September 1830; 'The sum information that we could collect from the natives was that ... White Whales or Porpoises are not very numerous in the River and that they do not kill many in it.' The Inuit were encouraged to hunt belugas in the Koksoak River but few were taken during the period from 1830 to 1842 when the post was operational (see Appendix 1). The few whales that were caught were taken in July and August. Expeditions were sent out to find better whaling areas but none were established.

Between 1842 and 1866 this post was abandoned but when the post reopened in 1867 a small whale fishery was initiated. Nets were used but there were difficulties with the extremely high tides and the belugas soon learned to avoid the nets (see Appendix 1). The fishery was regarded as unsuccessful; during the 14 year period from 1867 to 1880, only 113 belguas were recorded as being taken. Apart from the commercial fishery, few belugas were traded to the HBC by the natives because relatively small numbers were taken and the price paid by the HBC was not sufficient incentive (see Appendix 1).

The beluga fishery was more successful during the 1880's. The recorded take for the Ungava Bay region in the 1880's was 722 whales. In 1887, it is noted in the Fort Chimo logbook that 84 belugas, 'the usual number', were taken in the summer net fishery on the Koksoak River (Appendix 1). Although the fishery was better than ever before, the catches still did not meet HBC expectations. The highest recorded annual catch in the Ungava Bay region in the 1800's was 160 whales in 1889. The catch declined after 1880 and the fishery eventually failed in 1904 (Fig. 20). The fishery

was expanded in the 1890's to the George, Whale and Leaf rivers but the decline continued. Catches on the rivers ranged up to 90 per year. In the 1890's, the fishery at the Leaf River was the most successful in Ungava Bay. There was apparently very little trade in beluga products apart from the commercial fisheries during this period. Several confounding factors make it difficult to interpret the extent of hunting pressure on belugas in the late 1800's. It appears that prices paid for beluga products were inversely related to the numbers of halfskins available for sale (Fig. 21). This suggests that the market for halfskins was limited. Presumably, when prices were high, there was incentive for Inuit to trade skins to the HBC. The commercial price also apparently affected the commercial fishery by the HBC. For example, 'I visited Leaf River in June ... there are plenty of whales there but it is a very bad place to get at and the price of oil and skin is so low, that I do not think it is worth while to fish it' (Appendix 1, 28 September 1887).

The 1900's

The 1900's saw an expansion in the number of HBC posts and in the commercial whaling activities. In addition, competition between the HBC and other companies and free traders characterized the early 1900's. In 1904, the Revillon Frères Company established a post at Fort Chimo and immediately tried to secure the trade between the Inuit and the HBC. The French company established a post at the Leaf River in 1906 and the HBC was forced to send men and supplies there to intercept the Inuit and retain their trade. Competition between the two companies led to the expansion of both companies along the Quebec coast of Hudson Strait and northward on the Eastmain.

The HBC established 10 posts between 1909 and 1938; five posts on Hudson Strait (Wolstenholme 1909, Stuparts Bay 1914, Sugluk East 1925, Sugluk West 1930, Diana Bay 1938), three posts in Ungava Bay (Leaf River 1920, Whale River 1927, Payne Bay 1930), and two posts on the Eastmain (Port Harrison 1921, Povungnituk Bay 1923). Small scale whale fisheries were undertaken at all posts except Payne Bay. In the Stuparts Bay area, the hunt and netting operations took place from late June to mid November, with few accounts of whales being taken in August (Appendix 4). The best period for the hunt in the Sugluk West area was July (Appendix 11). The Wolstenholme hunt extended from mid-July until mid-November with most catches in late September and in October (Appendix 3). Both of these posts had a longer hunt than the summer (July-August) hunt at Fort Chimo, reflecting the extended season on Hudson Strait and the migratory patterns of the belugas, which were apparently similar to present patterns.

The annual catches of belugas at most of these posts were relatively small, although an occasional large seasonal take was recorded. It should be noted that although the numbers of belugas taken at each post were not high (see Appendices 1-12), the increased number of posts meant that the total kill did increase during the 1900's.

In addition to the increased number of posts, the use of guns became more common during the 1900's. This led to an increase in the number of belugas that were killed but not retrieved. The traditional methods using harpoons and seal skin floats resulted in a small loss rate. An extreme example of loss rates associated with the use of guns is the following entry from the Wolstenholme post journals: 'Although we killed and wounded about 14 of them but only managed to get one. The rest got out to deep water and sunk.' (Appendix 3).

The data for the 1950's are scattered. Three posts (Leaf River, Diana Bay, and George River) had closed by 1952, thereby reducing the hunting impact on the belugas. The reported annual beluga catches at the remaining posts generally ranged between 20 and 50 belugas per post. In the Great Whale River community, 193 Inuit took 34, 26, and 55 whales in the years 1954, 1958 and 1959, respectively (Breton-Provencher 1980). J. Decker, the RCMP officer at Port Harrison (Inukjuak) from 1953 to 1957, said that belugas were uncommon around Inukjuak and most people made trips to the Nastapoka River where belugas were known to be found in good numbers (pers. comm.). Port Harrison's reported annual catches (including the Nastapoka River) for 1957, 1958, and 1959, from its late July to late September/November hunt, were 20, 28, and 55 whales, respectively (Appendix 13, RCMP Game Reports). According to R.B. Tingling (pers. comm.), HBC servant at Povungnituk, there was a rare large kill of 128 whales in 1948 when a herd of belugas was driven into a shallow bay near Povungnituk. Normally only small numbers were taken. In 1956 Quaqtak had a high annual catch of 78 whales (Evans 1968).

Data for the 1960's are also scattered. It is likely that the catch of belugas at the various posts had not changed radically. An increase in the Inuit population at Great Whale River could have resulted in increased catches, but this is not likely since the kills in the 1970's were less than those in the 1950's (Breton-Provencher 1980). J. Witty (pers. comm.), former school principal in Povungnituk, recalled a take of 103 belugas, which were driven into a shallow bay and killed. This was noted to be an exceptionally large catch, so much so that most of the meat and muktuk was wasted.

The Area Economic Survey of western Ungava Bay (Currie 1968) noted that the average annual harvest for western Ungava Bay was from 50 to 76 belugas; many of these were taken from small traditional camps. Quaqtak and Diana Bay took an average of 50 whales annually (Currie 1968). Currie (1968:17) stated that 'no accurate census has even been taken of the population of either species [seal, walrus, white whale] in western Ungava and no records have been kept of the total annual harvest.' Nonetheless, Currie (1968) maintained that the annual beluga harvest had sharply declined and that the resource was underexploited. [We consider this to be unproven.] Although there had been no accurate census, the Area Economic Survey recommended the exploitation of belugas in Leaf and Payne bays, where large herds reportedly occurred in July and August, and in the area of Cape Hopes Advance.

1975-1979

Recent harvest levels of marine mammals in arctic Quebec have been determined by the Native

Harvesting Research Committee established under the James Bay and Northern Quebec Agreement. These data have been presented in detail in NHRC (1975, 1976) and Boulva (1981) and are summarized for beluga harvests in Table 7. These results indicate that harvests in the 1975 to 1978 period have averaged about 525 belugas per year. It should be remembered that two communities (Povungnituk and Ivujivik) do not participate in these studies and that the figures represent landed catch with no allowance for animals that are killed and lost. Annual harvests are highest along the Quebec coast of Hudson Strait where the average is about 245 belugas per year. Annual harvests for communities in Ungava Bay average about 137 belugas per year, and for communities on the Eastmain the average is about 144 per year.

Table 7. Harvest of belugas in arctic Quebec, 1975 to 1978, provided by the Native Harvesting Research Committee.[1]

| Area | 1975 | 1976 | 1977 | 1978 | Totals |
|---|---|---|---|---|---|
| Ungava Bay[2] | 130 | 184 | 194 | 38 | 546 |
| Hudson Strait[3] | 315 | 219 | 307 | 137 | 978 |
| Eastmain[4] | 128 | 143 | 181 | 122 | 574 |
| Totals | 573 | 546 | 682 | 297 | 2,098 |

[1] From NHRC (1975, 1976) and Boulva (1981).

[2] Includes Port Burwell, George River, Fort Chimo, Leaf Bay and Payne Bay.

[3] Includes Quaqtak, Wakeham Bay and Sugluk (part). Excludes Ivujivik.

[4] Includes Akulivik, Inukjuak and Great Whale River. Excludes Povungnituk.

Data on the monthly distribution of beluga harvests in the communities of arctic Quebec are presented in Fig. 22, 23 and 24. These data were provided by the Native Harvesting Research Committee. They refer to reported kills in each community and, therefore, total somewhat less than the figures in Table 7, which are corrected to account for hunters who did not report their harvests. Several important trends are evident from these data.

In Ungava Bay, the levels of harvest are quite variable among communities and among years. Most kills in each community occur in the months of June, July and August (Fig. 23). These are primarily animals that summer in the coastal waters of Ungava Bay, and the average harvest of about 137 belugas per year is substantial in light of the small numbers of animals that presently summer in the area.

The largest kills of belugas (about 245/yr) in northern Quebec are taken by communities on Hudson Strait (Fig. 22). Generally the largest numbers of belugas are taken in June and July at all communities. A small but regular kill of belugas during August at Wakeham Bay indicates that some belugas remain in the area during summer. A second but smaller peak of harvest occurs in October and November. Occasionally the November take of belugas at Quaqtak can be quite high and in 1976 greatly exceeded the spring take.

The monthly harvest patterns at the communities along the east coast of Hudson Bay indicate that summering populations are taken (Fig. 24). Most of the kill in July and August occurs at the estuaries of the Nastapoka, Great Whale and Little Whale rivers. Harvests in June and September may represent animals migrating to and from the area. Again, the average annual harvest of about 144 belugas along the east coast of Hudson Bay (Table 7) is high in relation to the number of animals found in this area in the summer of 1980.

## REGIONAL ACCOUNTS OF BELUGA HABITS

Our surveys and shore-based observations of belugas in northern Quebec provide only an intermittent and (in the case of the Hudson's Bay Company observations) historic dimension to the picture, and we have benefited greatly in our understanding of the natural history of belugas from conversations with hunters from different settlements. The following brief notes on the habits of belugas were extracted from casual conversations or recorded interviews with hunters from many settlements. These accounts are organized by region and should not necessarily be construed as representative of the opinions of all hunters.

### Ungava Bay

In July belugas are usually found in river mouths; the areas around the Whale and Mucalic rivers are the most notable places in Ungava Bay where belugas congregate. Hunters from Fort Chimo and George River consider the Mucalic River to be the best place in Ungava Bay to hunt belugas in the summer.

Belugas are said to enter the Mucalic River during the rising tide and move in a very typical pattern. Because of this they can be netted from certain prominences; alternatively, the hunters wait until the belugas pass by a certain point before they launch their canoes and attempt to drive the whales into shallow water. One hunter said that in 1979 in the Mucalic River he had killed a female beluga that was attended by a small calf that still had an umbilicus. The calf was kept alive for a day in a freshwater lake.

Some whales can also be found in the summer at the mouths of the Koksoak and Leaf rivers, and, especially in late summer, some of them can be found quite far up the rivers. In the Koksoak River they had been seen as far as the junction of the Caniapiscau River, which is 130 km upstream from the sea.

Heavy seas during the summer, along with the extreme tides in southern Ungava Bay, sometimes make it difficult for hunters to travel to the Mucalic River from George River or Fort Chimo. This trip is all but impossible in the autumn.

Hence hunters know very little about where the whales go later in the season.

Hudson Strait

In winter a few belugas are occasionally seen in pack ice along the floe edge on the south shore of Hudson Strait. Occasionally individuals have been killed in the winter months near the communities of Quaqtak, Sugluk and Ivujivik.

In spring, belugas move westward along the south coast of Hudson Strait and can be seen as early as May, although the peak migration occurs in June and early July. During the spring migration belugas travel quickly (compared to the fall migration), and they rarely stop to rest or feed.

Few whales are expected to be found along the coast of Hudson Strait in mid-summer except for a few that are known to frequent the area between Joy Bay and Whitley Bay (61°30'N, 71°40'W). Here they are hunted by the people from Wakeham Bay. The females are said to give birth in July close to shore and 'they carry their young on their backs'.

Naalak Nappaluk from Wakeham Bay said that in the spring the belugas appear to be fat and yellow but during the fall migration when belugas move eastward their skin is pure white and the animals tend to be skinny. Usually few belugas were seen during the spring and autumn migration at Wakeham Bay in 1980. Hunters from Quaqtak said that few belugas had been seen during the spring migration but that numbers seen in autumn were above normal.

The autumn migration is reportedly accomplished more casually than the spring migration. Belugas are usually seen at Sugluk in late September and in October, at Wakeham Bay in September and October, and at Quaqtak in October and November. During the autumn migration, the belugas move very close to shore and enter some inlets to feed and to escape killer whales that frequent the deeper waters of Hudson Strait. Deception Bay and Sugluk Inlet are said to be important feeding areas. Hunters from Quaqtak said that belugas tend to congregate to feed along the east coast of Quaqtak Peninsula, particularly among the Eider Islands, in the autumn.

Quaqtak is a well known concentration area for belugas in the late autumn and hunters from other communities often travel there to hunt. The animals can be frightened into shallow bays such as Mission Cove by shooting into the water beyond them. Cape Hopes Advance is also a good place from which to hunt belugas as they move by the point.

Eastmain

Belugas enter Hudson Bay from Hudson Strait in June. One hunter from Inukjuak said that in the spring the belugas migrate farther from shore since the sound is still covered with ice, but in the autumn they usually travel close to shore.

During July belugas concentrate in the estuaries of the Nastapoka, Little and Great Whale rivers. Fewer belugas return to Great Whale River now than in previous years. Belugas are thought to be attracted to estuaries because of the warmth and they shed their skins there, like seals. Once their skin is shed they move out to sea and some may continue as far south as the Eastmain River in James Bay.

In July, belugas are hunted mainly in the estuaries of the Nastapoka, Little Whale and Great Whale rivers. Some hunting also takes place in Richmond Gulf, although the whales do not seem to favour any particular area in the Gulf. The Nastapoka River is thought to be one of the most important estuaries for belugas, although one hunter from Inukjuak said that there had been a notable decrease in their numbers because of hunting. He said that since speed boats have appeared, hunting has increased; and in summers with good weather, like 1980, many people hunt at the Nastapoka.

As belugas begin heading north again in September they congregate close to shore and feed heavily on cod and sculpin. On their northern migration to Hudson Strait they travel fast.

## DISCUSSION

### MOVEMENT PATTERNS

The results from this study, when combined with the knowledge of Inuit hunters, the harvest statistics, and the scattered literature, provide clarification of the movements of belugas along the coasts of arctic Quebec.

Belugas summer in two principal areas along the coasts of arctic Quebec. One group occupies coastal waters of southern Ungava Bay with heaviest use at the estuary of the Mucalic River. The other principal summering area is the coastal waters of southeastern Hudson Bay. Estuarine concentrations occur there in the Nastapoka and Little Whale rivers, and formerly occurred at the Great Whale River. Small numbers of belugas of unknown status also summer, at least in some years, in the Wakeham Bay area. There is likely no interchange during the summer between the Ungava Bay and Eastmain groups of belugas.

During the fall (September-October), Inuit from Inukjuak and Akulivik report a northward movement of belugas along the east coast of Hudson Bay. These animals are thought to be moving to wintering areas in Hudson Strait. Our surveys in 1980 could not extend offshore to the Belcher Islands and associated island groups. Belugas occur in the Belcher Islands during the summer and fall (Manning 1976; Schwartz 1976; D.E. Sergeant, pers. comm.) although their numbers are certainly not large. The relationships between the belugas in the Belcher Islands and those along the southeast coast of Hudson Bay are unknown, although D.E. Sergeant (pers. comm.) suggests that, based on a sample of 13 males, the Belcher Island belugas are intermediate in length between the west Hudson Bay and the Cumberland Sound populations.

Belugas have been recorded in winter in the recurring leads and tide cracks in James Bay (Jonkel 1969; Schwartz 1976). Jonkel suggested that a few hundred might have been present in April 1969 but it is not known if belugas regularly winter in

James Bay. The summering areas of these animals are unknown.

There is an eastward fall migration of belugas into and through western Hudson Strait. This migration clearly involves more animals than can be accounted for by the southeast Hudson Bay animals, and probably the Belcher Island animals. Belugas from northern and probably western Hudson Bay are undoubtedly involved in the migration into Hudson Strait. Gaston (MS) noted small numbers of belugas near Salisbury Island in early September 1980, and Sergeant (1968) reported 'large concentrations of belugas' in the vicinity of Salisbury and Nottingham islands in October. T. Echerk (pers. comm.), a hunter from Coral Harbour, states that large numbers of belugas move westward along the south coast of Southampton Island in spring (May-June) and eastward again in September.

Large numbers of belugas winter among the pack ice throughout Hudson Strait and Ungava Bay (this study). The estimated number in these areas in March 1981 was about 9000 animals. Small numbers were also present in northern Hudson Bay; however, virtually none were found in northwestern Hudson Bay. The only known large population of belugas that still exists in the Hudson Bay-Foxe Basin area is the west Hudson Bay population, which summers along the Manitoba coast of Hudson Bay. Clearly, this population winters in Hudson Strait and Ungava Bay.

There is a westward spring migration of belugas along the south coast of Hudson Strait in late May through July. Some of these animals apparently move south along the east coast of Hudson Bay according to reports of Inuit hunters. Most must continue to summering grounds in western Hudson Bay.

## STOCK IDENTITY

Sergeant and Brodie (1969) and Sergeant (1973, pers. comm.) used two lines of evidence to suggest that west Hudson Bay belugas constitute a separate stock that wintered in northwest Hudson Bay and were thus isolated from other stocks: (1) West Hudson Bay belugas were significantly smaller than belugas from Cumberland Sound. (2) Extensive tagging of animals in southwest Hudson Bay produced only seven recaptures, all in western Hudson Bay--five at Whale Cove and two at Repulse Bay (Sergeant pers. comm.). No recoveries were received from Southampton Island or from Hudson Strait in spite of the relatively intensive hunts in these areas. It should be noted that the tags used probably had a high loss rate.

The status of belugas in northern Quebec and their intermediate geographic position between the popu[illegible] western Hudson Bay and that from Cumberland Sound was not considered by Sergeant and Brodie (1969) or Sergeant (1973). The present study shows that belugas from western Hudson Bay winter in Hudson Strait; they likely mix with belugas that summer in northern Quebec. Morphometric data show that northern Quebec belugas are similar to belugas from western Hudson Bay and are smaller than belugas from Cumberland Sound.

Although the two groups of belugas that summer in northern Quebec (i.e. Ungava Bay and Eastmain) cannot be readily distinguished from each other or from the western Hudson Bay belugas on the basis of morphometric data, we believe that the Ungava Bay, Eastmain and west Hudson Bay groups should be treated as separate stocks for management purposes. There is clearly no mixing among these three groups during the summer. In the cases of Ungava and Eastmain groups, the traditionality of their occupation of certain areas and the documented decline in numbers indicate that there probably is little exchange or recruitment from other populations. Mitchell and Reeves (1981) stated that the long-term decline in the Cumberland Sound beluga population, without any apparent immigration from other populations, was sufficient evidence for treating the population as a separate stock for management purposes.

## POPULATION ESTIMATES AND STATUS

Our estimates of the sizes of the populations of summering belugas in arctic Quebec assume that the majority of belugas were in coastal waters when we conducted our survey in late July and that most of those animals in coastal waters were detected. The assumption that a majority of the animals are in coastal waters in mid-summer is reasonable based on studies in other areas (Sergeant 1973; Finley 1976; Fraker 1980) although at least in some areas not all animals are actually in estuaries (Davis and Finley 1979).

Certainly we did not see all of the belugas during our summer surveys of the Quebec coast; however, weather and sea conditions were very favourable and we believe that we detected a majority of the animals that were present in coastal waters. Turbid water was experienced only in local areas around the Mucalic and Whale rivers, but this did not greatly hinder our ability to detect belugas since during calm conditions their presence was obvious from the wakes they made at the surface. Our ability to detect seabirds on the surface of the water gave us a measure of confidence in our ability to detect marine mammals, and occasionally the resighting of individual belugas in areas already covered by us gave us an additional measure of confidence. For example, on 24 July we conducted a survey along the west coast of Ungava Bay and spotted an adult beluga accompanied by two grey immatures. Two hours later during a return survey about 2-3 km offshore the second observer spotted a group of belugas in the same vicinity as during the earlier coverage; we circled the group and verified that it consisted of an adult and two grey immatures.

### Eastmain

Only 162 belugas were recorded in our late July survey of the Eastmain. In addition, 21 belugas had been killed at the Nastapoka River before our survey. We saw no belugas between the Great Whale River and Richmond Gulf even though this area was surveyed on two consecutive days. Breton-Provencher (1980) surveyed this latter area on several occasions in July 1978 and estimated that a maximum of about 220 belugas were present during any one survey, and many of these were in the estuary of the Little Whale River. We feel certain that we did not miss any significant numbers in this area in July 1980.

Even if we allow for an unsuspected 50% underestimation of numbers during the surveys, the

present population along southeast Hudson Bay is small, probably fewer than 350 belugas. No estimates are available for the Belcher Islands and other offshore islands.

Historic levels of the Eastmain population were much higher. The commercial fishery of the Hudson's Bay Company took at least 4509 belugas from the Great Whale and Little Whale rivers in the 1854 to 1860 period (Francis 1977). The large numbers that were present in the Nastapoka River may not have been heavily harvested since the HBC did not operate their fishery on the Nastapoka. A reasonable estimate is that the southeast Hudson Bay stock of belugas may have numbered as many as 5000 animals in the 1840's.

Ungava Bay

Our surveys of the coast of Ungava Bay in July revealed only about 50 animals. Even if a high proportion of the animals present were not detected, this population presently numbers in the very low hundreds, at most.

Judging from the intensity of the historic whale fishery in Ungava Bay, the number of belugas there was smaller than that on the Eastmain. Nonetheless, a minimum of 778 whales were taken during the period of maximum HBC whaling activity between 1881 and 1890. Rough calculations, based on the assumption of 0.08 net recruitment rate, indicate that the population could not have been smaller than about 1000 in order to sustain these losses. However, there is some evidence that the population was declining in the 1890's.

General trends

Although intensive whale fisheries were largely abandoned after 1900, sustained and expanded trading in 'porpoise' skins and oil was continued by the Hudson's Bay Company and Revillon Frères Ltd. This, along with the introduction of firearms to the native population, was probably sufficient pressure to prevent the depleted stocks from recovering in the first half of this century. In the 1960's the introduction of outboard motors added yet another advantage to hunters, and drives occasionally resulted in large kills near some settlements on the Eastmain. During the 1970's the trend has been to increased mobility with more powerful outboards and thus easier access to hunting areas that were once considered remote from settlements.

In 1980, hunters from Inukjuak were able to travel to the Nastapoka River in about 8 hours using boats powered by 75-140 HP engines. These forays in July and August of 1980 resulted in kills of not less than 40 belugas from the Nastapoka estuary. It is clear that the small herd that we observed will be unable to sustain such high losses unless there is recruitment from other areas. During the period from 1975 to 1978 the reported takes of belugas from three settlements on the Eastmain have been relatively constant between 122 and 181 (NHRC 1975, 1976). There are several possible explanations for this coincidence of low current population estimates and high current harvest levels:

1. That the available population is close to extinction. The level and range of hunter effort may have expanded to sustain present harvest levels. If this is the case, it is expected that the levels of harvest will drop drastically in the near future.
2. That the harvest levels provided by NHRC (1975, 1976) may be overestimated. However, an independent estimate of the beluga kill in Great Whale River in 1978 indicates that the NHRC figure was too low that year (Breton-Provencher 1980). Our own records indicate a total kill of at least 40 belugas by Inukjuak hunters in 1980; this total is similar to NHRC figures for previous years.
3. That we missed large numbers of belugas during our survey of the Eastmain, and thus have seriously underestimated the population size. This we do not believe as we have previously explained.
4. That most of the population was not present in coastal waters during our surveys. As pointed out previously, this does not seem likely.
5. That belugas are immigrating from other areas.

If present levels of harvest continue on the Eastmain, then we will have reason to re-evaluate the above assumptions. At present we believe that it is prudent to recognize the Eastmain belugas as an endangered stock. The Nastapoka and Little Whale river estuaries appear to be important to their survival.

The summer population of belugas in Ungava Bay also appears to be seriously depleted and the Mucalic River appears to be an important refuge that was used by a maximum of 25 belugas in the summer of 1980. It is possible that the group forms the core reproductive unit of the Ungava stock since many of them were females with newborn calves. During the course of the summer we know of at least 14 belugas taken around the Mucalic estuary by George River and Fort Chimo hunters. Many of these were females, some with newborn calves. A recently established Hunter Support Program appears to be encouraging additional hunting pressure on this group.

## MANAGEMENT IMPLICATIONS

For management purposes, it is appropriate to consider that three 'stocks' of belugas occur in arctic Quebec.

1. A transient stock (8000-9000 animals) that winters in the pack ice of Hudson Strait and Ungava Bay and migrates through Hudson Strait to summering areas in western Hudson Bay. This stock is hunted by Inuit from four communities along the south coast of Hudson Strait. The annual catch by these communities (excluding Ivujivik, for which data are unavailable) ranged from 137 to 315 animals between 1975 and 1979. It should be noted that this stock is also harvested by communities on the south coasts of Baffin Island and Southampton Island, and along the west coast of Hudson Bay

south to Churchill, Manitoba. The catch from all these communities must be considered when managing this stock.

2. A summer-resident stock in Ungava Bay. The estuary of the Mucalic River is a significant summer habitat for a core group that did not exceed about 25 individuals in July and August of 198^. Scattered small numbers may also b found around Leaf River and Whale River. The stock is severely reduced from historic levels and is presently heavily hunted by people from Fort Chimo and George River. The annual catch reported by five settlements in Ungava Bay has ranged from 38 to 194 between 1975 and 1979. These animals are taken primarily during July and August, when only the Ungava 'stock' is in the area.
3. A stock that summers on the Eastmain of eastern Hudson Bay. The estuaries of the Little Whale and Nastapoka rivers represent significant summer habitat for the Eastmain stock. The estuary of the Great Whale River was historically of significance to the Eastmain population but is no longer so because of human habitation. A core group of about 150 individuals, mostly females with calves, occupied the Nastapoka estuary in July and August of 1980. The Eastmain stock is severely reduced from historic levels of possibly 5000 animals. It is hunted primarily from the communities of Great Whale River and Inukjuak. The annual catch of three settlements (exclusive of Povungnituk) on the Eastmain ranged from 122 to 181 between 1975 and 1979, and is taken primarily during July and August. It is probable that this stock winters in Hudson Strait, although the possibility that some of the animals winter in James Bay cannot be ruled out (cf. Jonkel 1969).

The Eastmain and Ungava 'stocks' of belugas have been seriously depleted and present levels of hunting appear to threaten their survival. Both stocks are particularly vulnerable since it appears that the core reproductive components of these groups are dependent on limited and specific habitat, the estuaries of the Mucalic and Nastapoka rivers. Severe hunting pressure is focused on both estuaries and the impact is directed at the most critical component of the stock, the females with their calves. Both estuaries may also be affected by Hydro Quebec's plans for the damming and diversions of rivers in northern Quebec.

## RECOMMENDATIONS

An important objective of this project has been to develop a framework for cooperative management-related research involving the native resource users and southern scientists. The design, conduct and reporting of this work demonstrates that the approach can provide useful and credible results. This cooperative approach is particularly important since the results of the study have clearly indicated that serious problems exist for the conservation of the Eastmain and Ungava Bay stocks of belugas. This finding will have a direct impact on the cultural and economic life of the communities involved.

We believe that the cooperative approach used to define the problem should now be extended to the process of finding a solution to the problem. The native hunters must be actively involved in the formulation and application of a management plan that conserves the beluga stock but is sensitive to the Inuit practice of whale hunting. The program of management will change the pattern of summer hunting and the level of harvests. Unless a cooperative approach to management is taken, the native involvement in research will be isolated from the applications of this research to management decisions. If this occurs, it will no doubt result in division and dissent and the objective of conservation will be seriously weakened.

### A strategy for management

The findings of the present study indicate that an active management program is needed to protect the Eastmain and Ungava Bay beluga 'stocks'. In our opinion, the logical group to develop the required cooperative management approach is the Research Department of Makivik Corporation with advice and support from appropriate scientists with experience in the area. The following strategy is recommended.

1. The results of the study must be summarized and translated into Inuktitut and presented to the Inuit. This is particularly important for the four communities that take belugas from the Nastapoka and Mucalic estuaries (i.e. Great Whale River, Inukjuak, Fort Chimo and George River).
2. Discussions with hunters should be held to clarify the relationship between the present study and its findings, and to identify and discuss potential management options.
3. A working group of Inuit hunters, Makivik personnel and scientists should be formed to review the available information and the opinions of the hunters in the various communities. The working group would examine various courses of action and then recommend a specific management program to protect the resource.
4. A modest ongoing reseach program should be conducted. It is important to conduct intensive surveys of the summering areas of the Eastmain and Ungava Bay 'stocks' to verify the population estimates made in 1980 and to determine whether immigration into these stocks has occurred from the population wintering in Hudson Strait. These efforts should continue the cooperative approach, and representatives of the working group (point 3 above) should participate.
   Verification of the 1980 estimates is important for reasons discussed in the text but also because major changes in Inuit resource-use patterns may be necessary and such changes should be

based on more than a single survey in a single year.

Management options

Several management options are available. Some of these are mentioned here but full discussion and recommendations should await the deliberations of the proposed working group. This group should consider all options and arrive at a management plan that protects the beluga stocks and also protects Inuit interests to the extent possible.

Options include establishing a quota system either by the government or voluntarily. The former situation is undesirable and would be opposed by the Inuit. Other options include the establishment of reserves in important estuaries where hunting would be discontinued, or establishment of closed seasons during the summer period when the Eastmain and Ungava Bay stocks are currently harvested in and near the Nastapoka and Mucalic estuaries.

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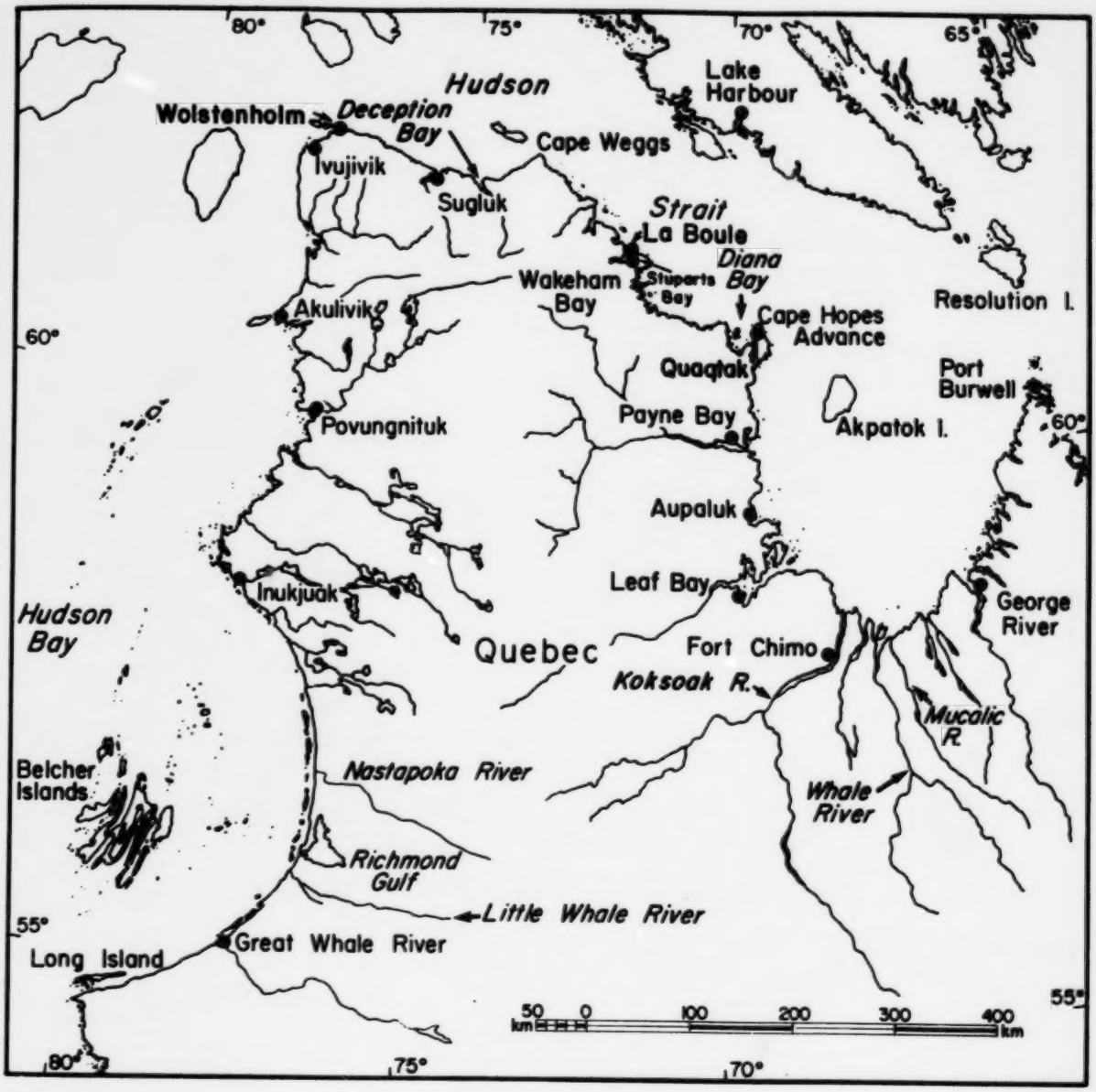



Fig. 1. The northern coast of Quebec showing settlements and geographic features referred to in the text.

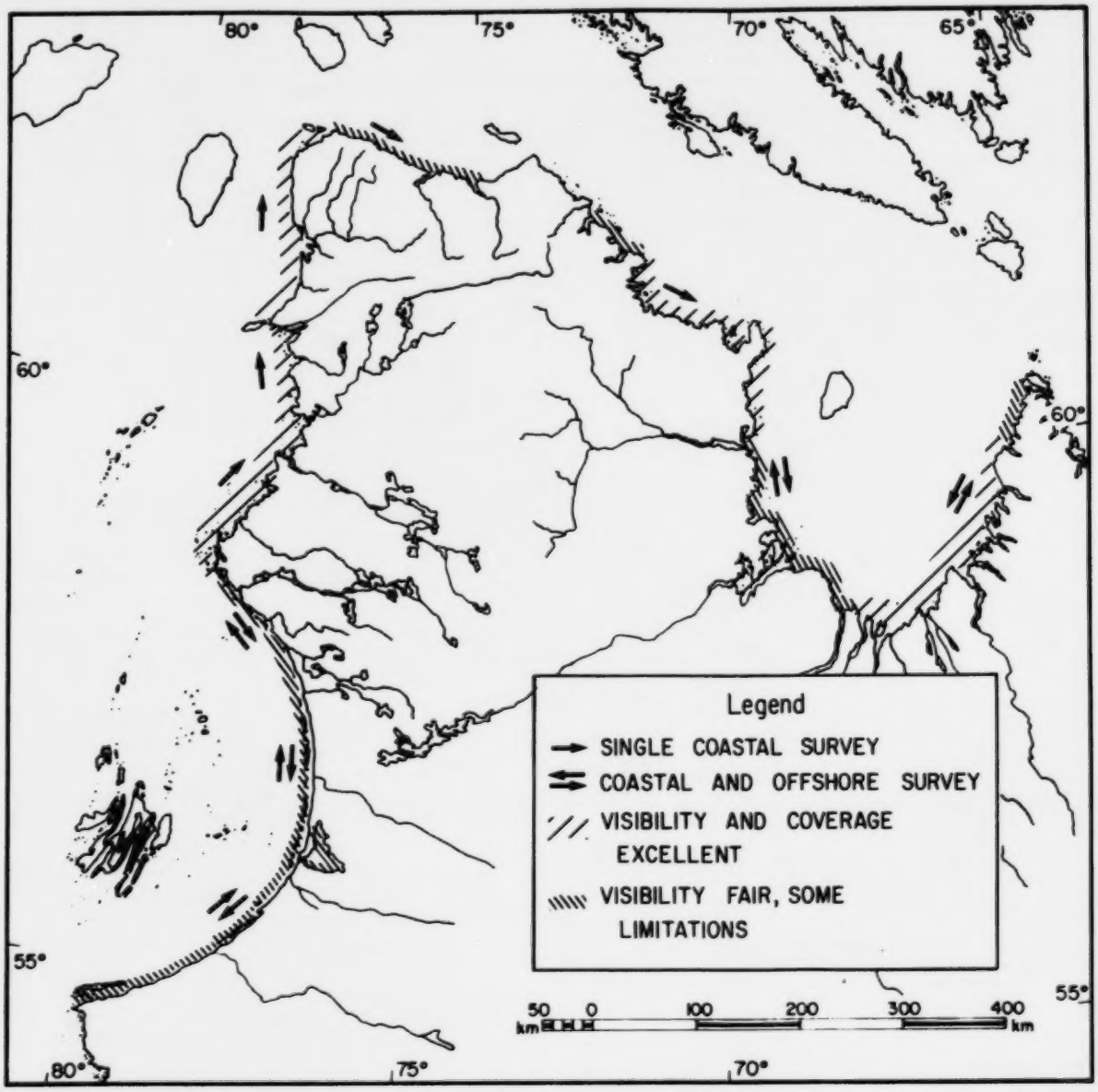



Fig. 2. Aerial survey coverage of the northern Quebec coast, July 1980. Some portions of the coast were covered only by a single flight whereas other areas were covered by coastal (within 1-2 km) and offshore (2-5 km) transects. Excellent visibility was experienced during calm seas and we were confident that we could detect virtually all belugas within 1 km of the aircraft, a majority of those within 2-3 km, and others more distant with the aid of binoculars. Wind-roughened water reduced detectability of belugas beyond 1 km, particularly when the observer faced the sun. White-capping of the sea, which severely reduced visibility, was experienced only locally and cannot be illustrated on this map scale.

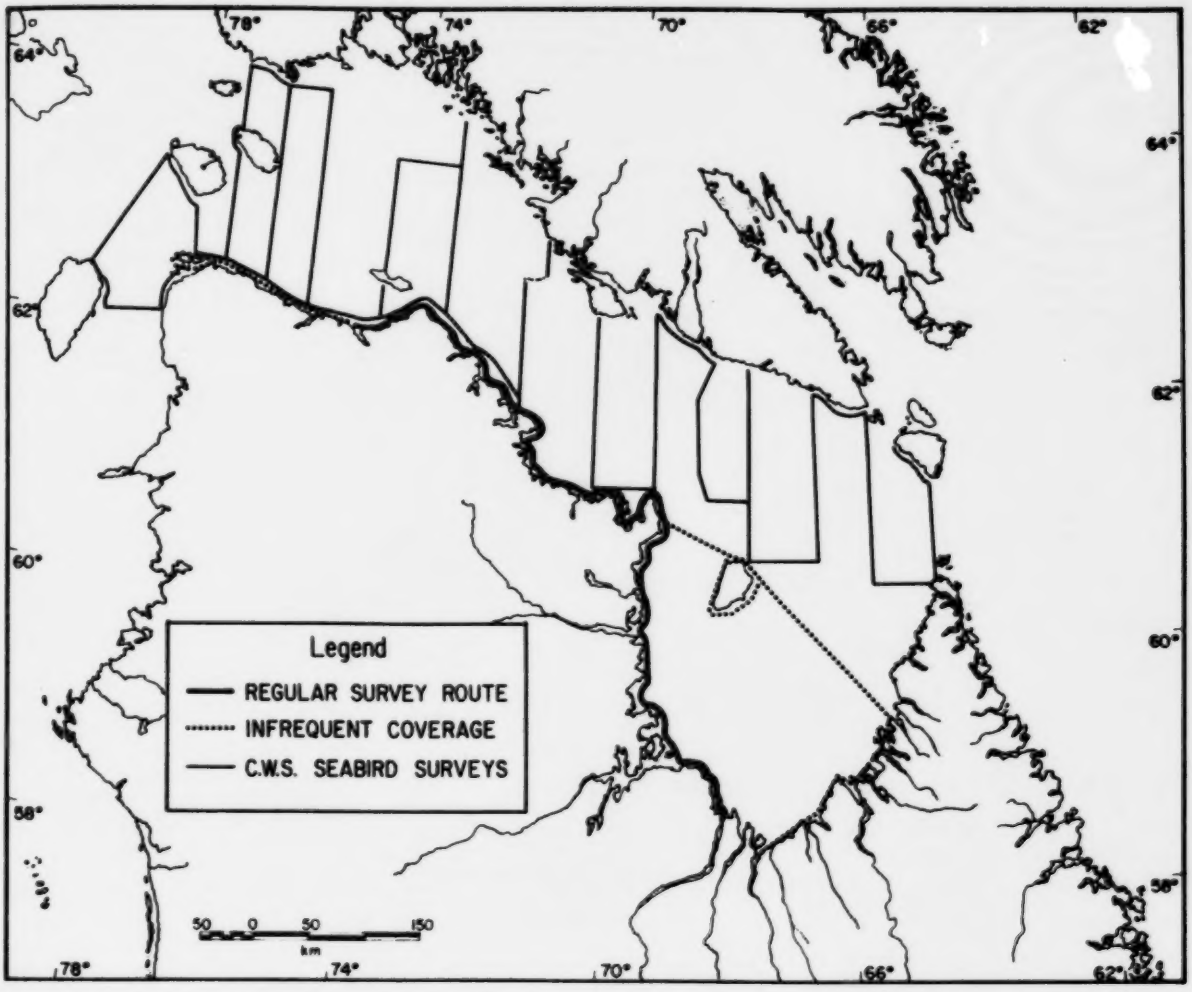
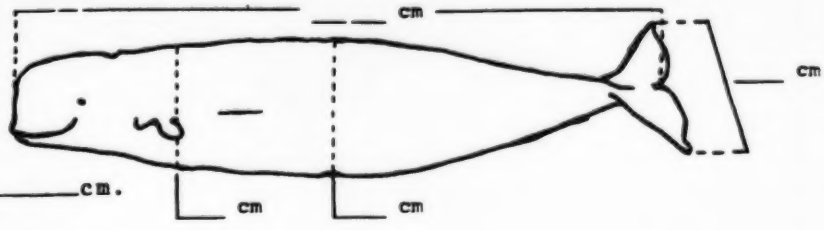



Fig. 3. Aerial survey coverage of Hudson Strait and Ungava Bay, September-November 1980. The extent and timing of surveys is given in Table 3.

## BELUGA WHALE SAMPLE SHEET

AREA:_____
ᓇᓂᑦ:

PHOTO No: _____.
SAMPLE NO._____. DATE:_____ FIELD WORKER:_____
ᐳᓗᓗᒍᖏᑦ ᐅᑐᖃᐅᖅᑕ: ᐅᓚᑦ: ᐊᕕᑕᑎ (ᐱᓇᓗᑎ):
(




SIZE:
ᐊᒥᓂᒪ:

BLUBBER THICKNESS:_____cm.
ᐅᖃᓗᑕ ᐃᓕᓂᖅ:

| COLOR: | WHITE | GREY | BROWN | OTHER:_____ |
|---|---|---|---|---|
| ᑕᐅᑐᖅ: | ᖃᐃᑕ | ᓗᐊᐊᓐ | ᑲᓗᓐ | ᐊᓗᐊ: |

SEX: MALE FEMALE
ᐊᑐᑎᐅᒪᖅ ᐊᒪᓚᓂ ᐊᖃᓴᐅᒪᖅ ?

IF FEMALE: WAS SHE WITH A NEWBORN CALF ? YES NO
ᐊᖃᓴᖅᑕ: ᐱᐊᕐᖃᖃᓂᒪᖅᑕ ? ᐊᒥᑐ ᐊᒥᒥᑐ

WAS SHE PREGNANT ? YES NO
ᐱᐊᕐᓵᖃᖃᓂᒪᖅᑕ ? ᐊᒥᑐ ᐊᒥᒥᑐ

WAS SHE GIVING MILK ? YES NO
ᐊᒪᒪᑎᓂᒪᖅᑕ ? ᐊᒥᑐ ᐊᒥᒥᑐ

| STOMACH: | FULL | PARTLY FULL | NEARLY EMPTY |
|---|---|---|---|
| ᐊᖃᑭᖅ: | ᑕᑕᑐᓐ | ᑕᑕᒪᓕᑐ | ᐃᓚᖃᓂᐊᕐᑐ |

| CONTENTS: | MOSTLY FISH | MOSTLY SHRIMP | MIXTURE OF BOTH |
|---|---|---|---|
| ᐃᓗᒥᐊᑕᖅ: | ᐃᖅᓯᓕᓗᐃᑦ | ᑭᒍᓕᓗᐃᑦ | ᐃᖅᓗᐃᓗ ᐊᒪᓗ ᑭᒍᐃᑦ |

| SAMPLES: | JAW | REPRODUCTIVE ORGANS: | UTERUS | OVARIES |
|---|---|---|---|---|
| ᐅᑐᖃᑎᑦ: | ᐊᓕᕐᓂᑦ | ᐱᑎᓂᒍᓇᓕᑦ (ᐱᐊᖏᑕᑎᓂᒍᓇᓕᒥ) | ᐃᓕᐊᖅ | ᐊᒪᓗ ᐃᓕᐊᖏᑕ | ᓄᑦᓯᑎᕐᑦ |

TESTICLES (ONE)
ᐃᓕᕐᑦ (ᐊᑕᐅᓂᐅᑎᓄᒍ)

| EYEBALLS: | MUKTUK: | KIDNEYS: | LIVER: | MUSCLE: |
|---|---|---|---|---|
| ᐃᓄᕐᑦ: | ᒪᑕᖅ: | ᑐᑕᕐᑦ: | ᑎᒍᖅ: | ᓄᑲᕐᑦ: |

**Fig. 4. An example of a field sampling sheet in English and Inuktitut showing basic standard measurements and biological samples taken from belugas.**

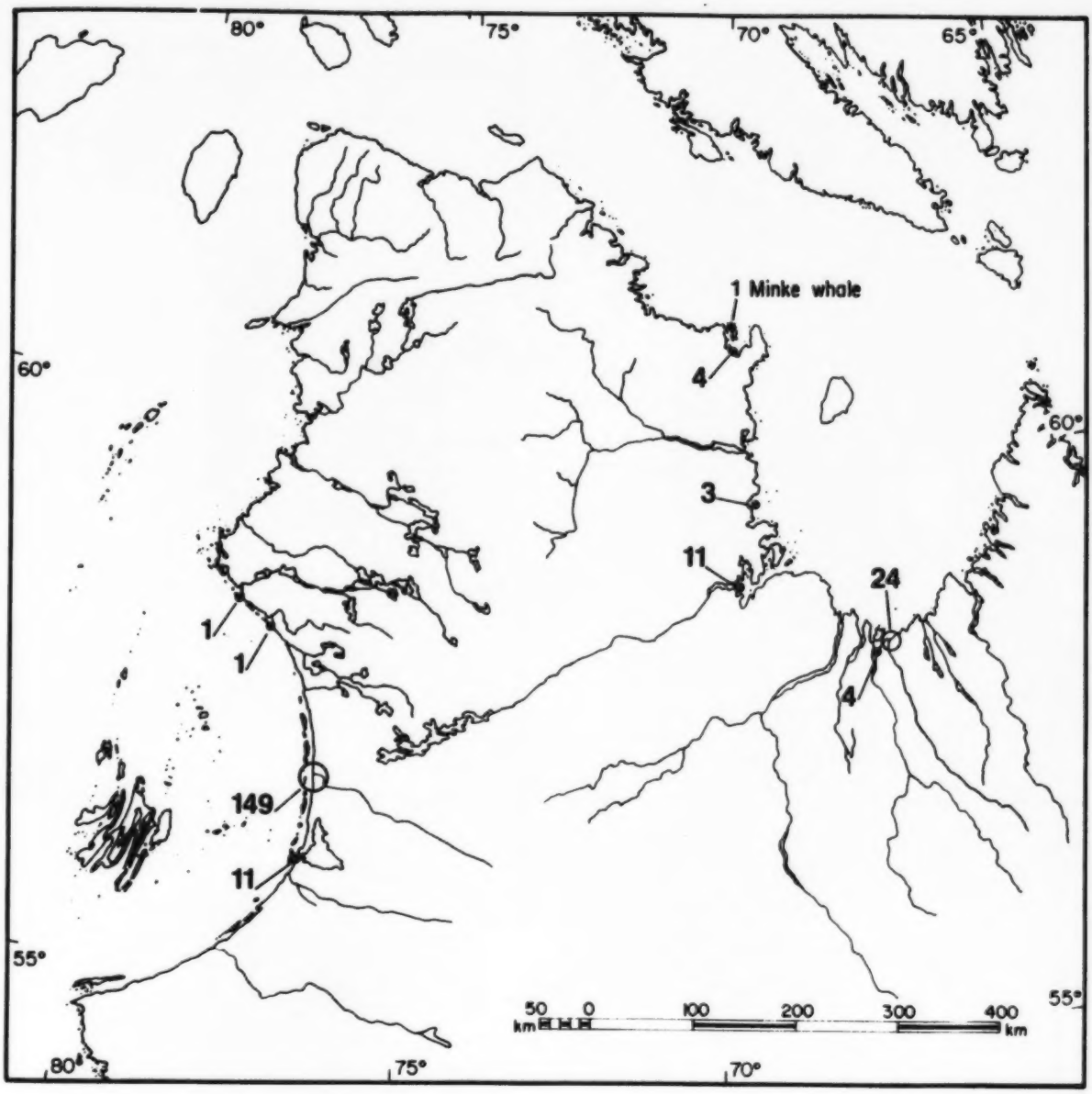



Fig. 5. Distribution of belugas and a single minke whale observed during aerial surveys of the northern Quebec coast, July 1980.

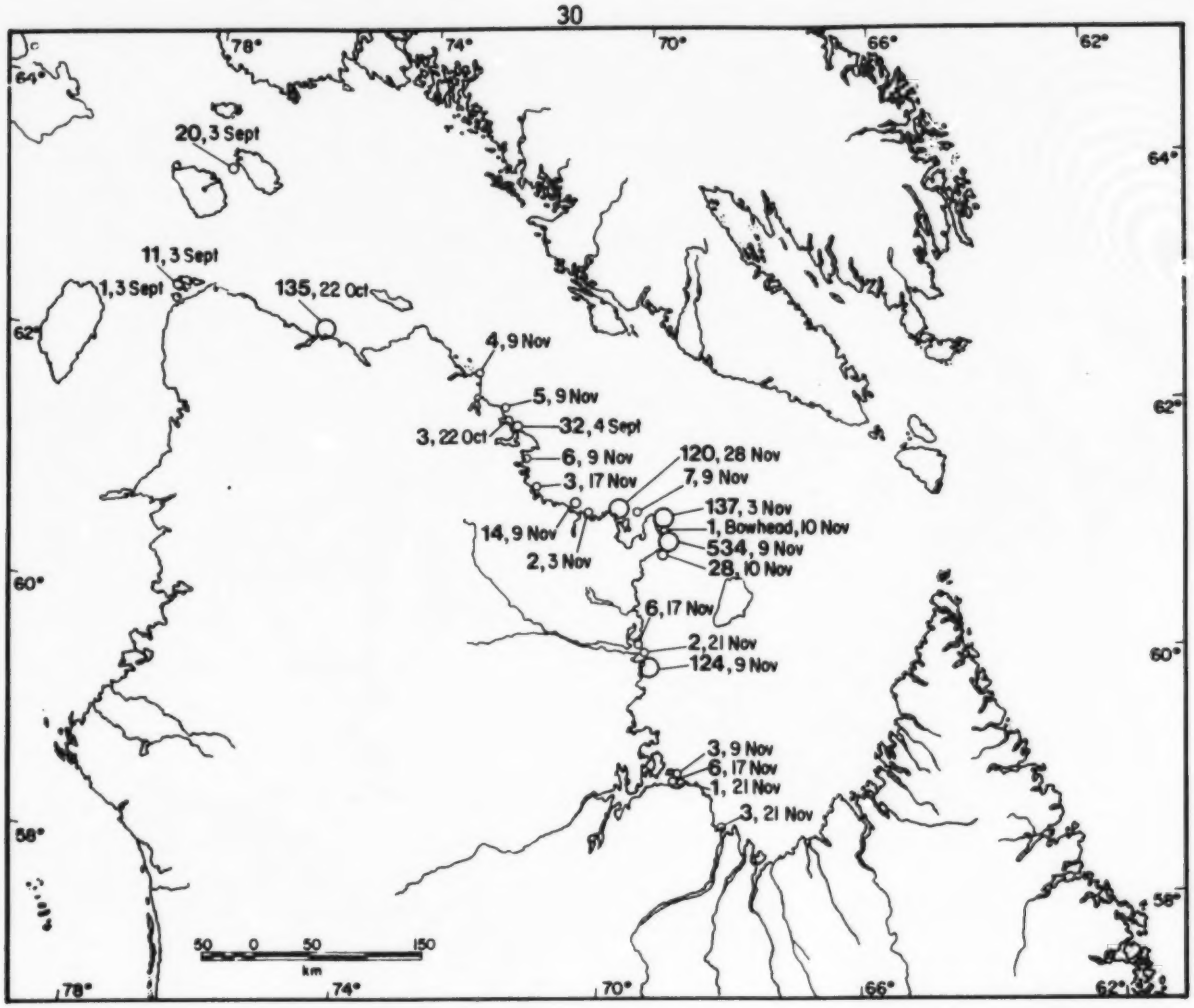



Fig. 6. Distribution of belugas and a single bowhead whale observed during aerial surveys of Hudson Strait and Ungava Bay, September-November 1980.

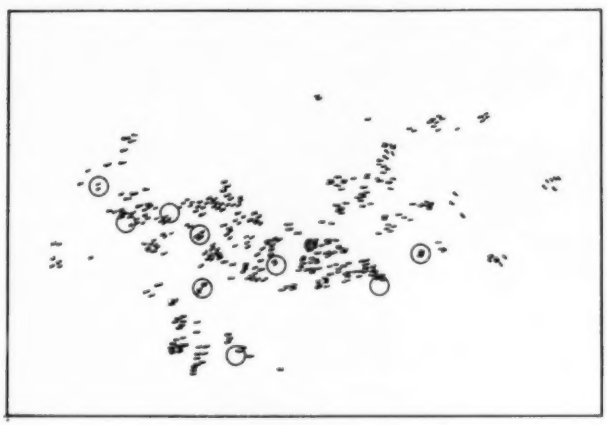


Fig. 7. Herd structure of 356 belugas photographed on 9 November 1980 near Quaqtak. Only 21 immatures could be positively identified and these are circled.

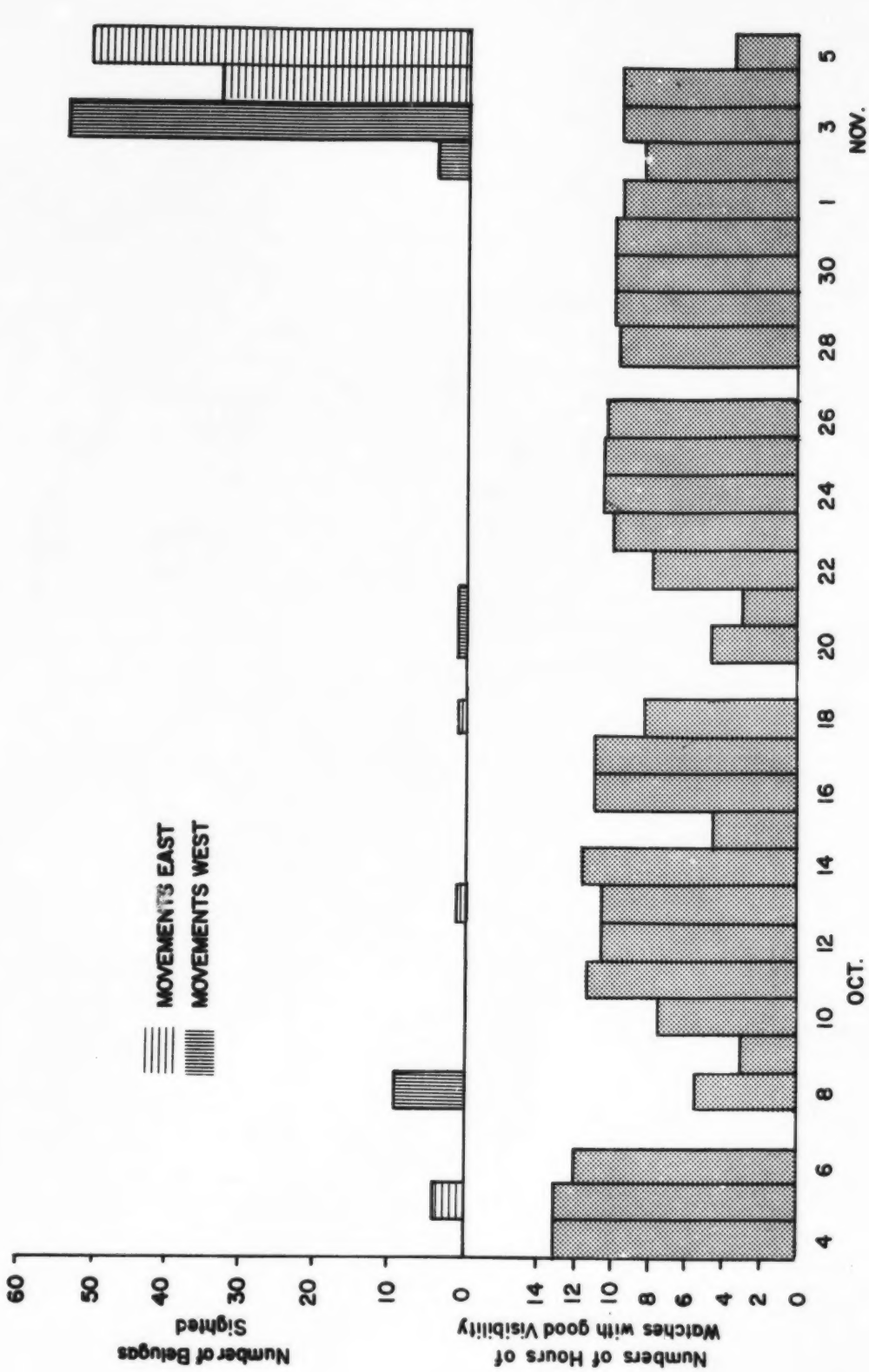



Fig. 8. Lengths of watches with good visibility and numbers of eastbound and westbound belugas sighted at Wakeham Bay during the period 4 October–5 November 1980.

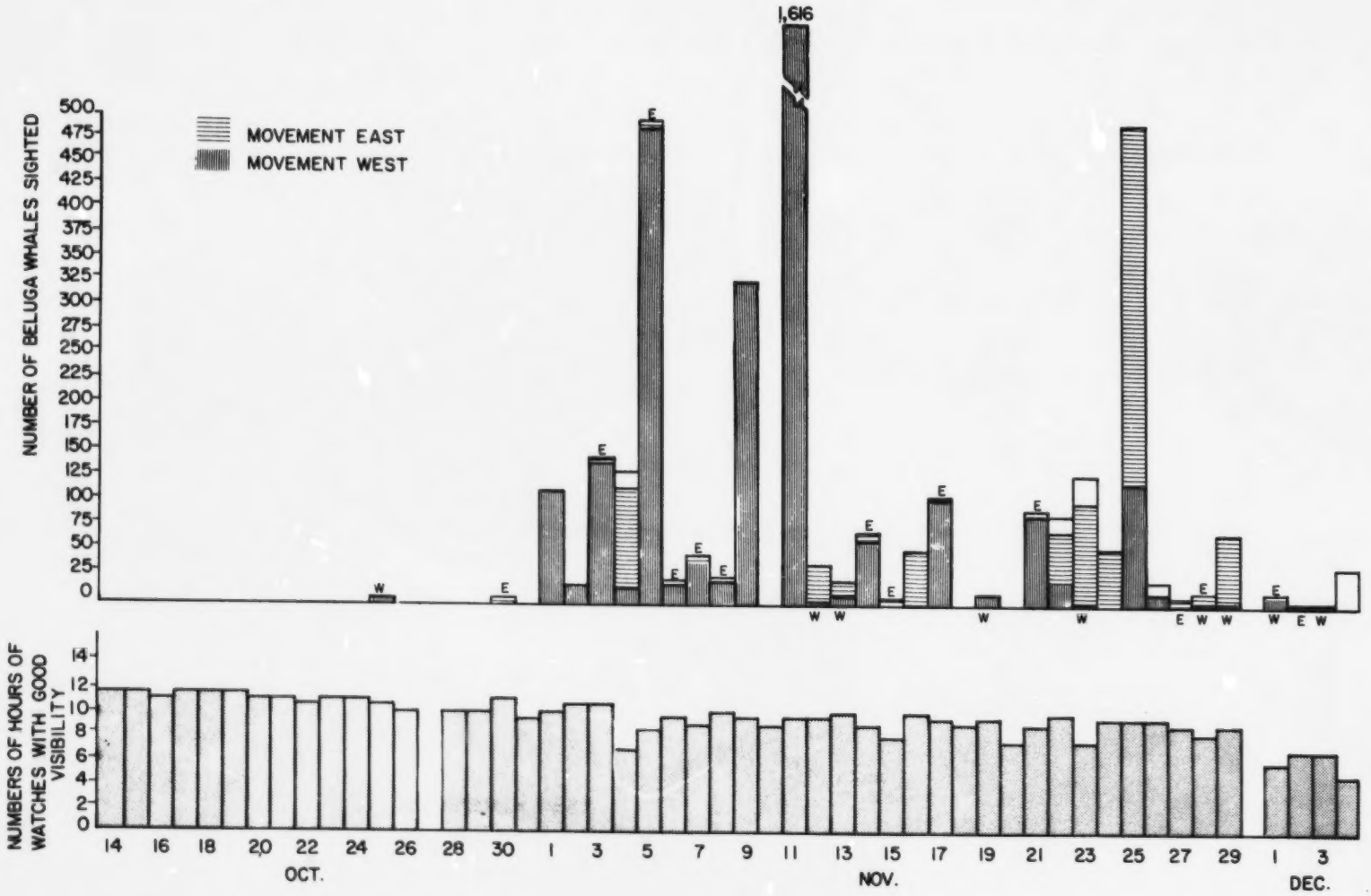



Fig. 9. Lengths of watches with good visibility and numbers of eastbound and westbound belugas sighted at Cape Hopes Advance during the period 14 October-4 December 1980.

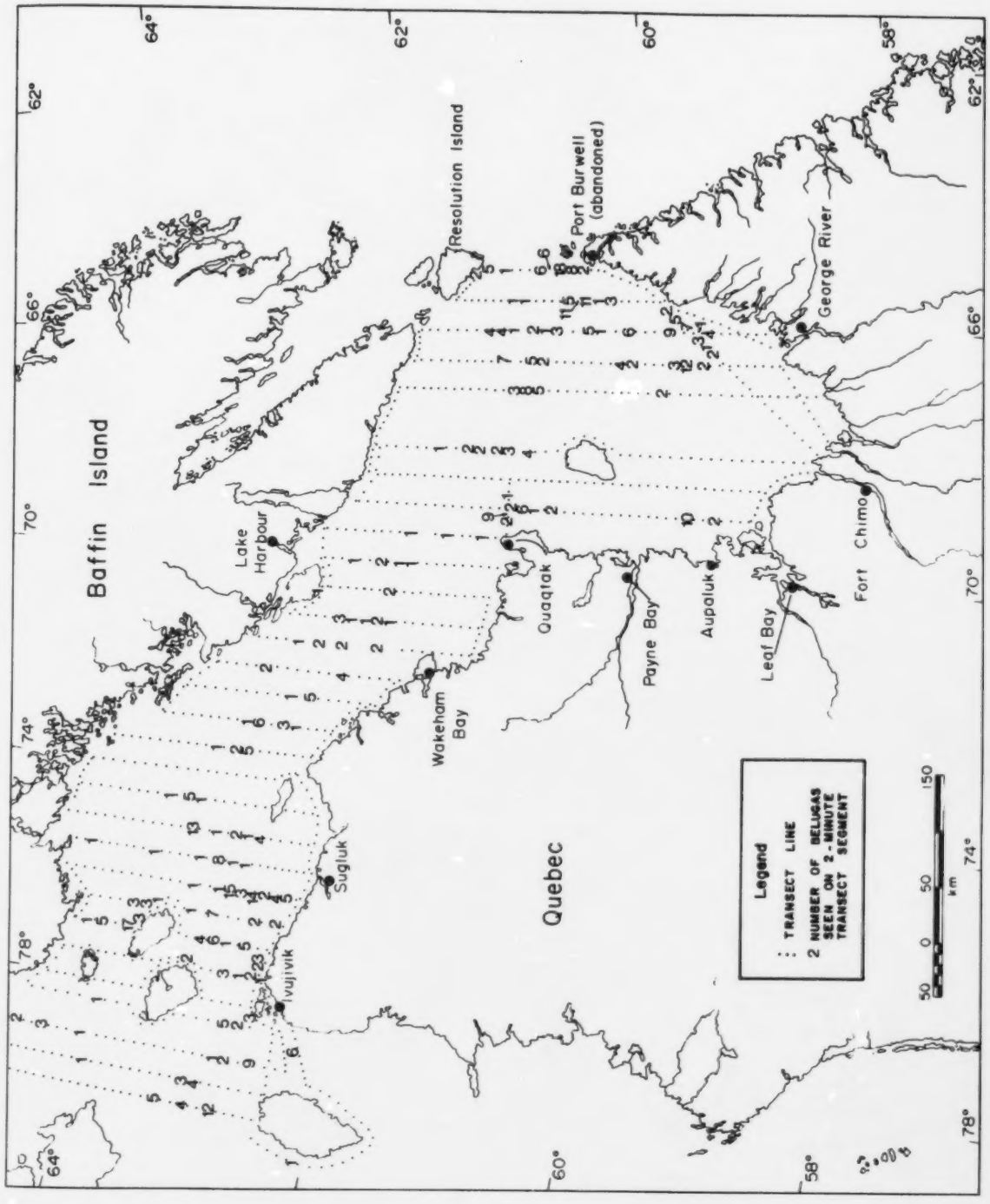



Fig. 10. Distribution and numbers of belugas observed during aerial surveys of Hudson Strait and Ungava Bay, late March 1981.

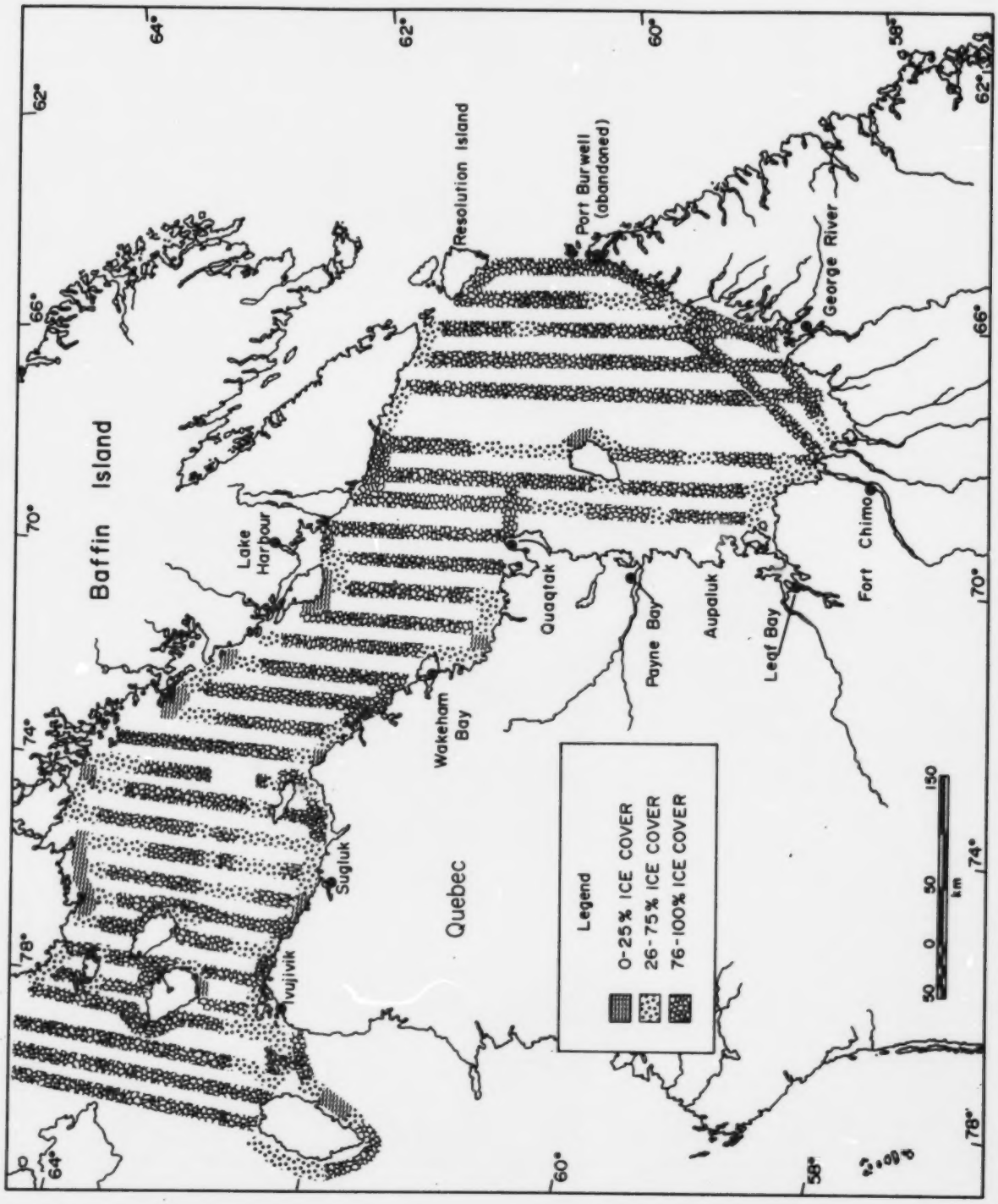



Fig. 11. Ice conditions observed during aerial surveys of Hudson Strait and Ungava Bay, late March 1981.

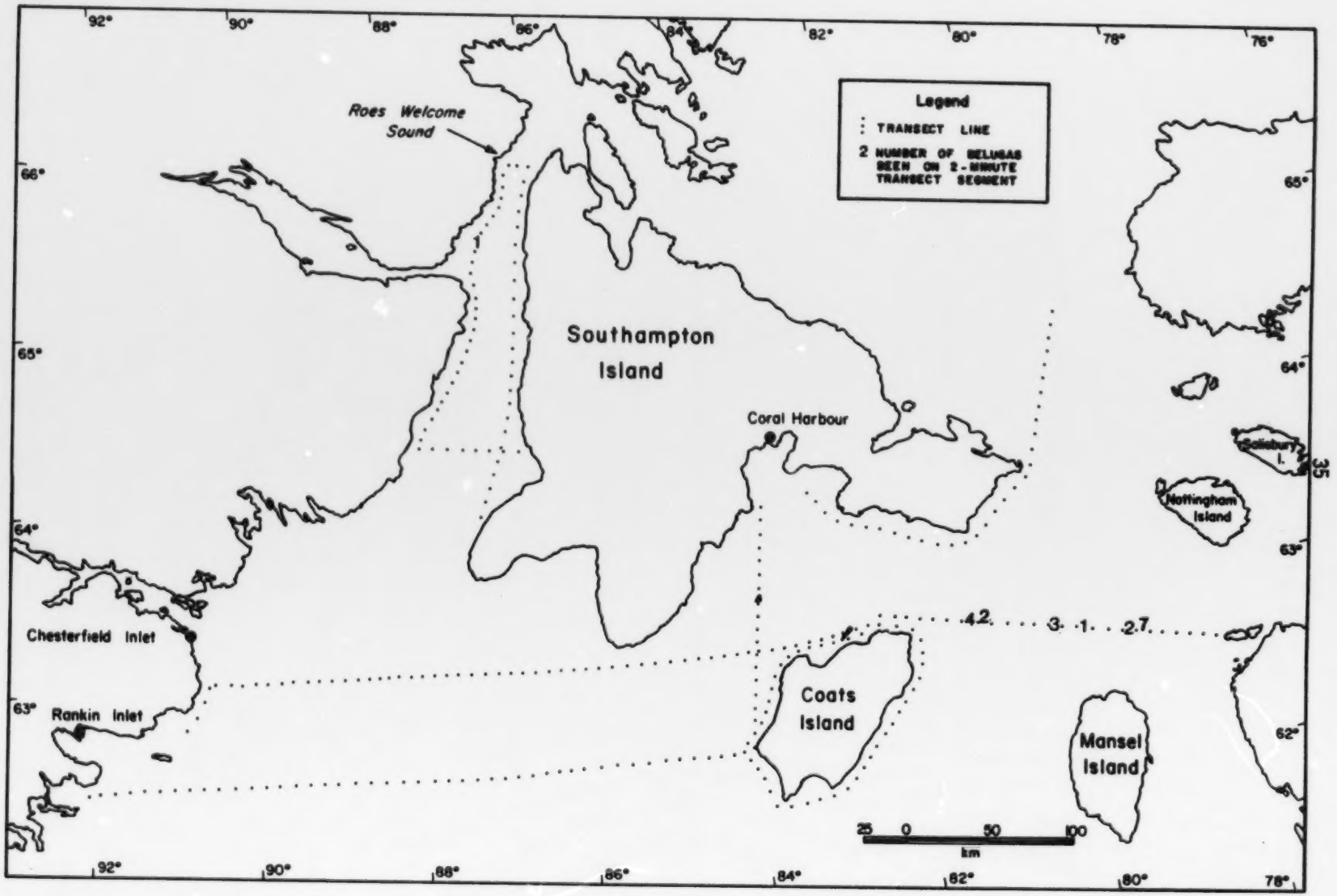



Fig. 12. Aerial survey coverage and observations of belugas in northern Hudson Bay, March 1981.

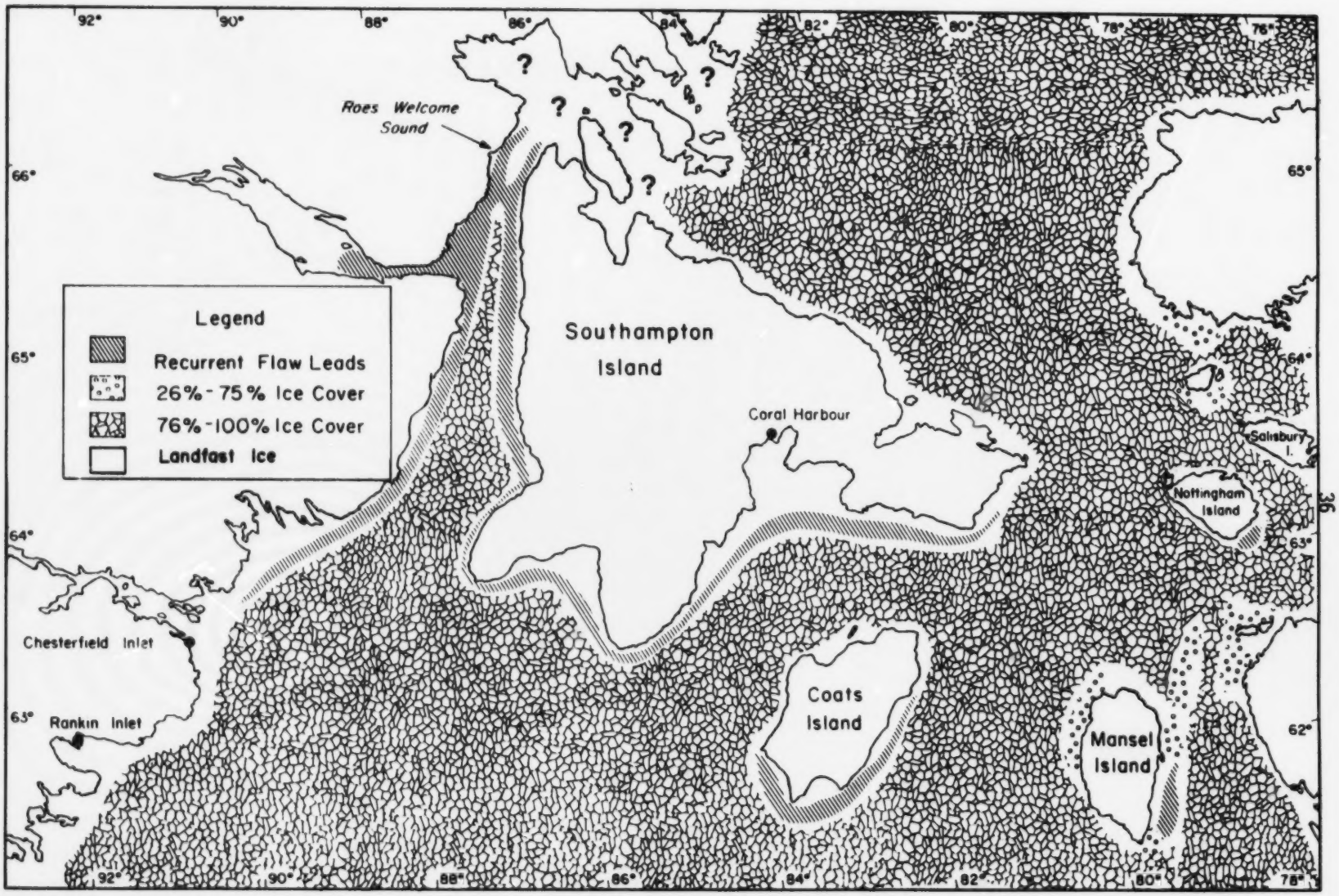



Fig. 13. Typical late winter ice conditions in northern Hudson Bay. From LANDSAT imagery, 5-6 March 1981. NOAA imagery, 12 March 1981 and aerial observations, late March 1981.

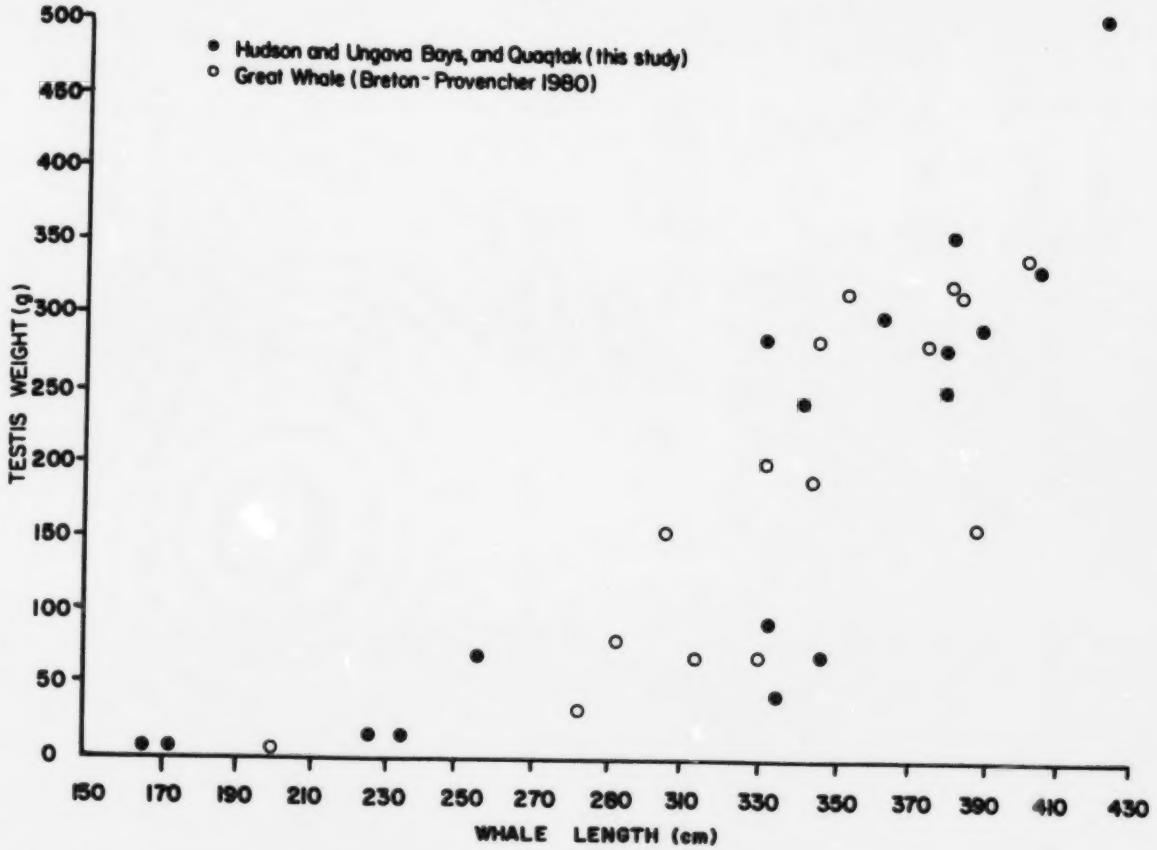



Fig. 14. Increase in testis weight in relation to beluga length for northern Quebec samples.

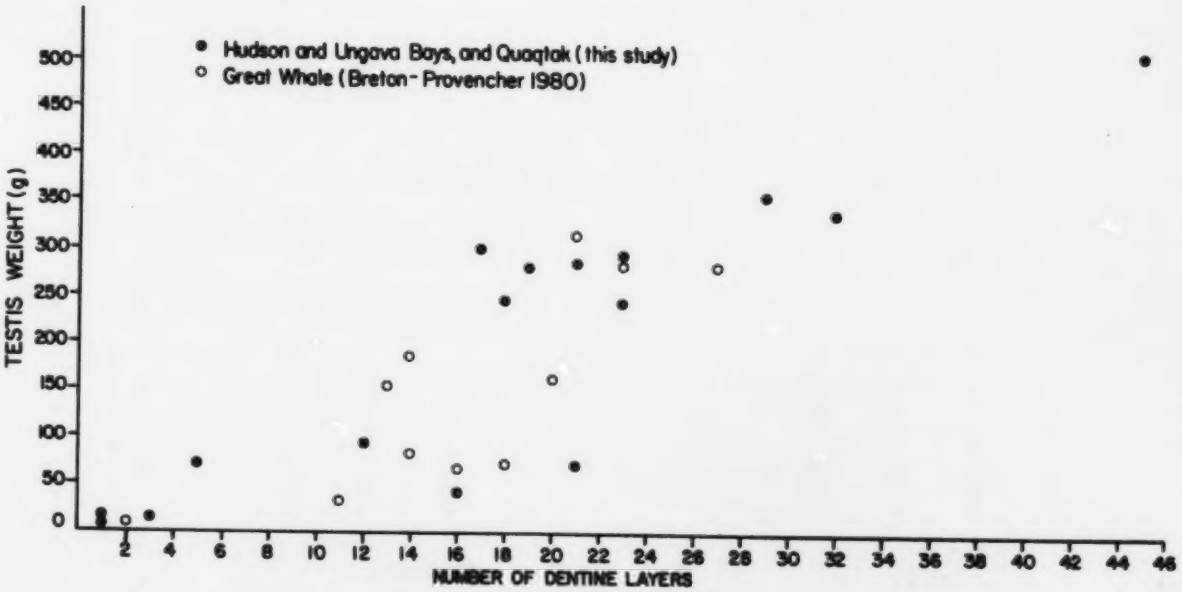

Hudson and Ungava Bays, and Quaqtak (this study)
Great Whale (Breton-Provencher 1980)
TESTIS WEIGHT (g)
NUMBER OF DENTINE LAYERS

Fig. 15. Increase in testis weight in relation to number of dentine layers of belugas from northern Quebec.

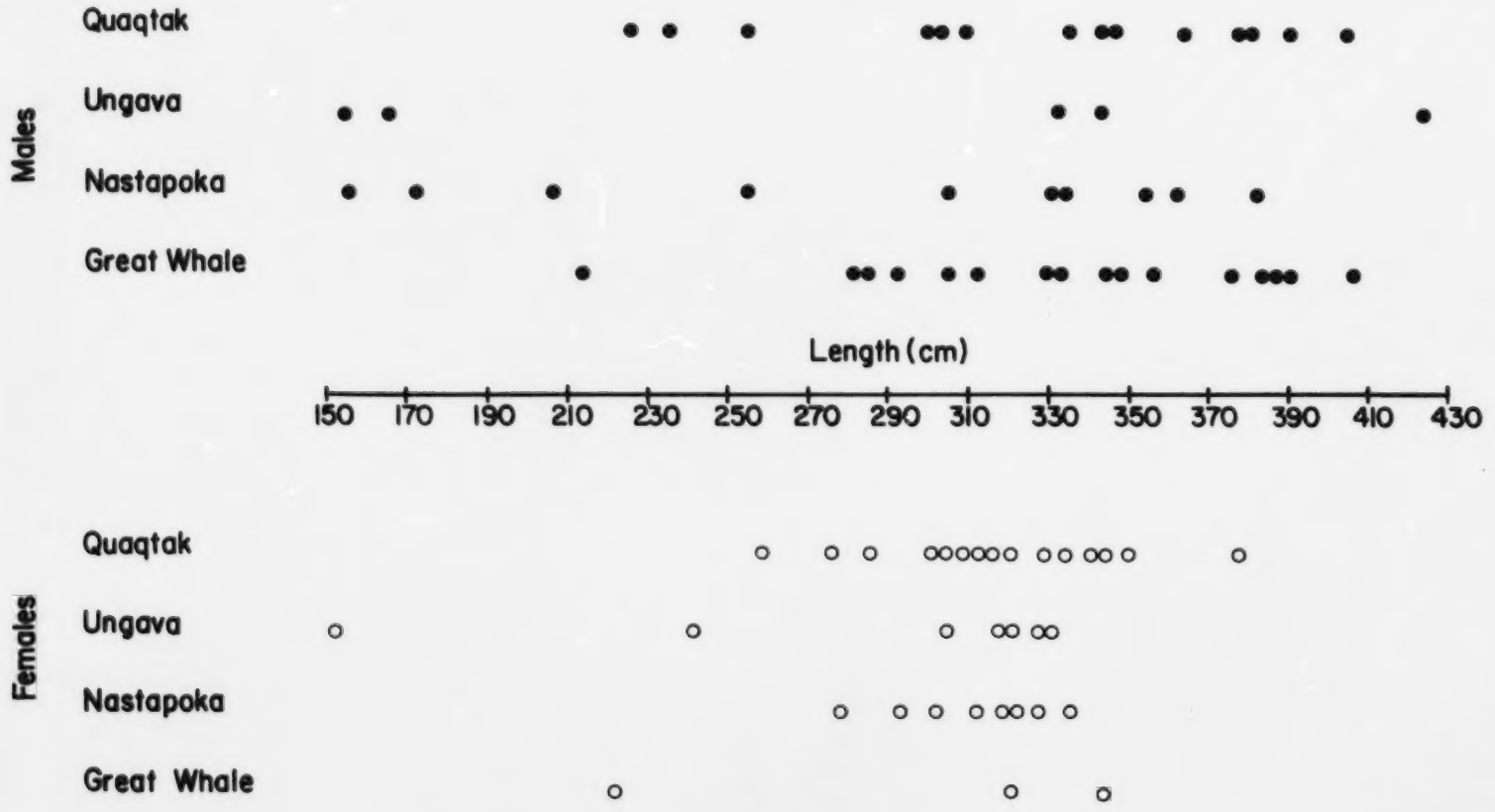





Fig. 16. Lengths of belugas sampled in this study, and of those from the Great Whale region (Breton-Provencher 1980).

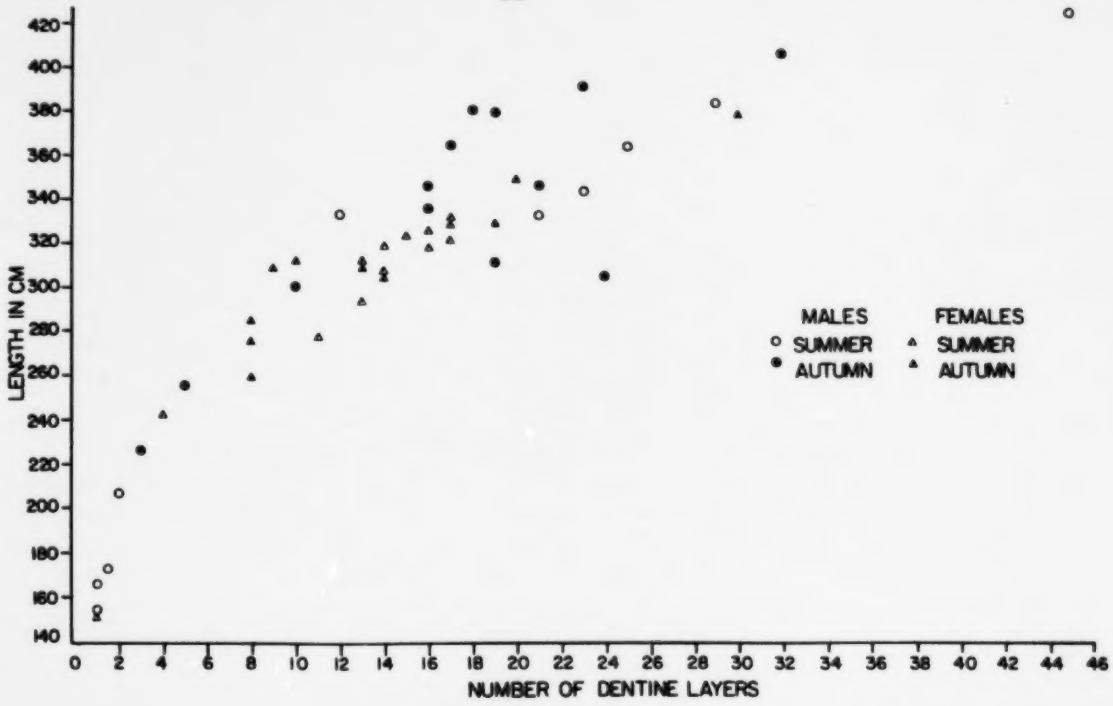



Fig. 17. Age-length data for belugas from eastern Hudson Bay, Ungava Bay, and Hudson Strait.

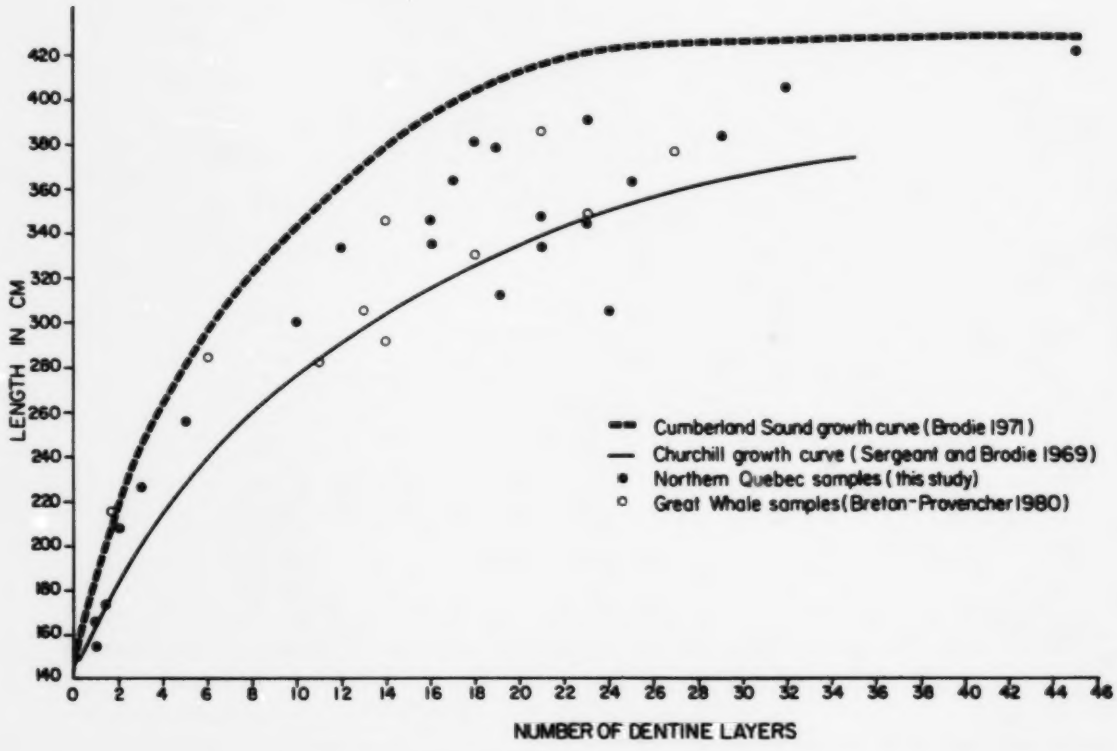

LENGTH IN CM
NUMBER OF DENTINE LAYERS
Cumberland Sound growth curve (Brodie 1971)
Churchill growth curve (Sergeant and Brodie 1969)
Northern Quebec samples (this study)
Great Whale samples (Breton-Provencher 1980)

Fig. 18. Age-length data for male belugas from northern Quebec, and growth curves for Churchill and Cumberland Sound belugas.

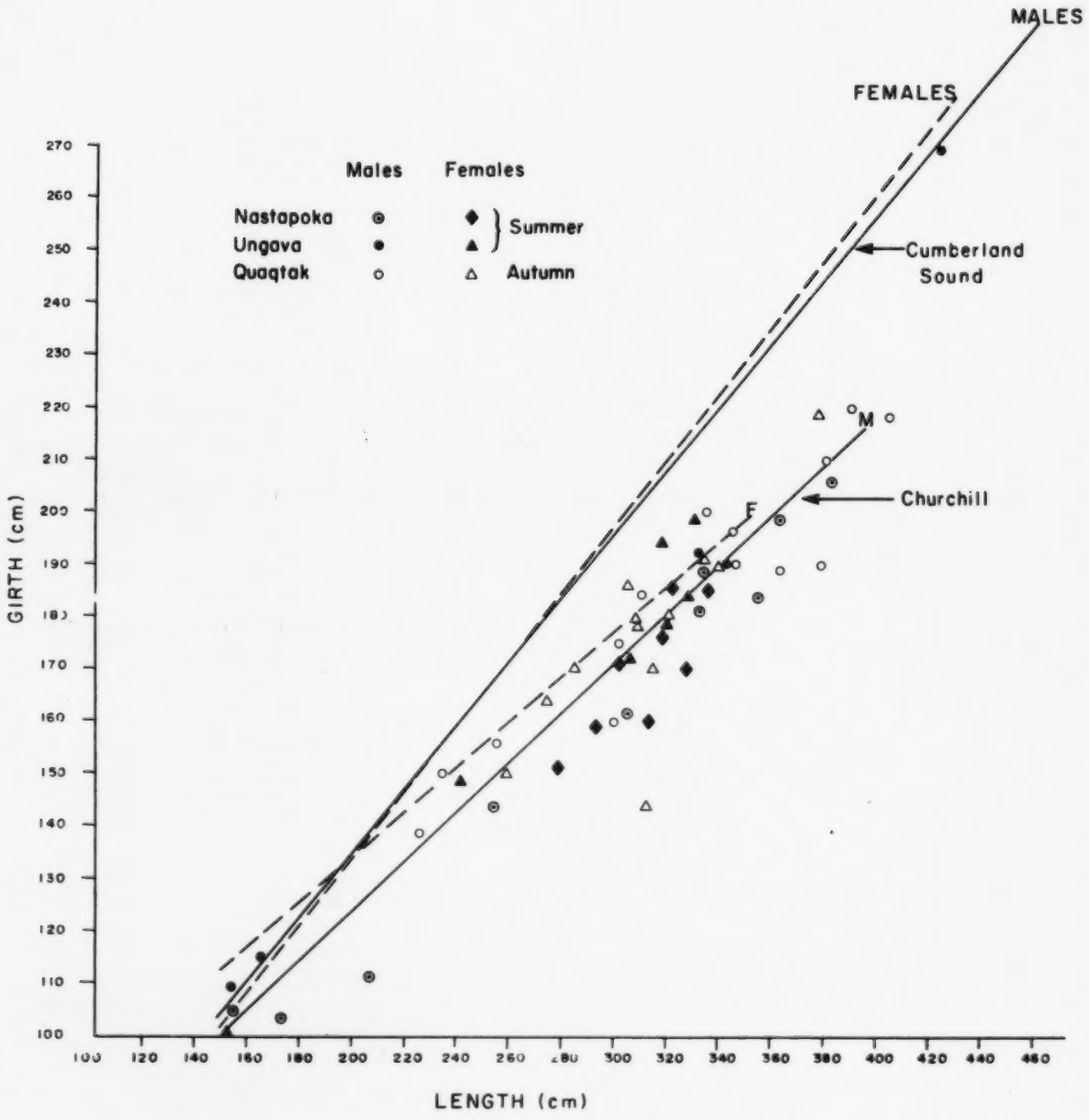



Fig. 19. Length-girth data for belugas from northern Quebec and regression lines of length-girth for Churchill and Cumberland Sound belugas.

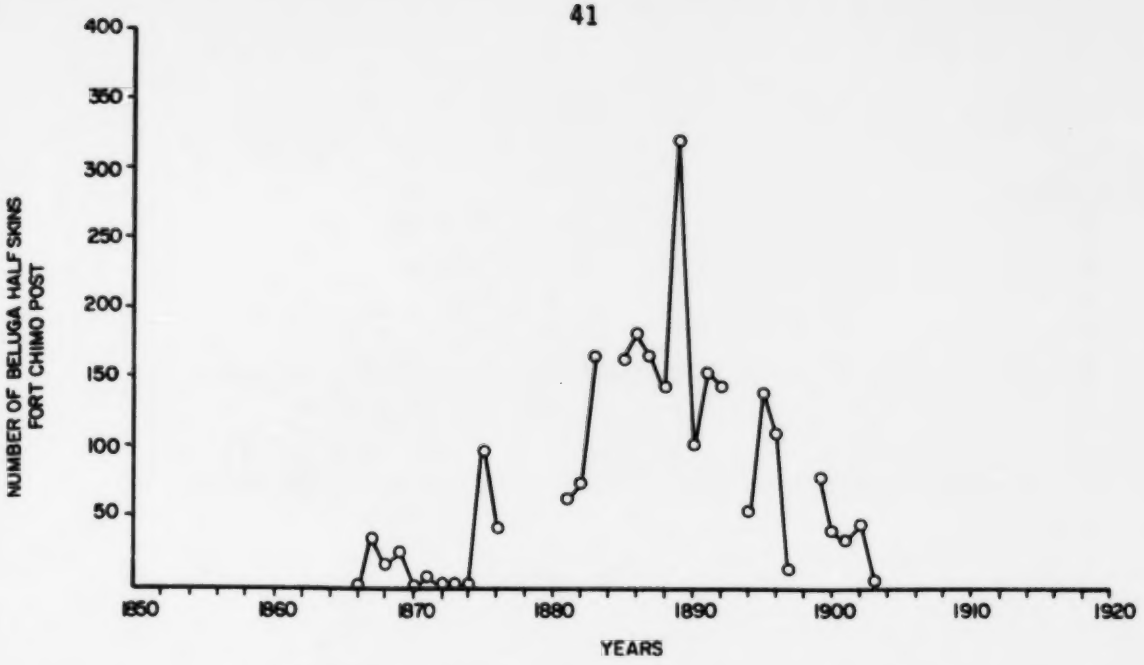



Fig. 20. Number of beluga halfskins shipped from the HBC Fort Chimo post during the period of maximum whaling effort.

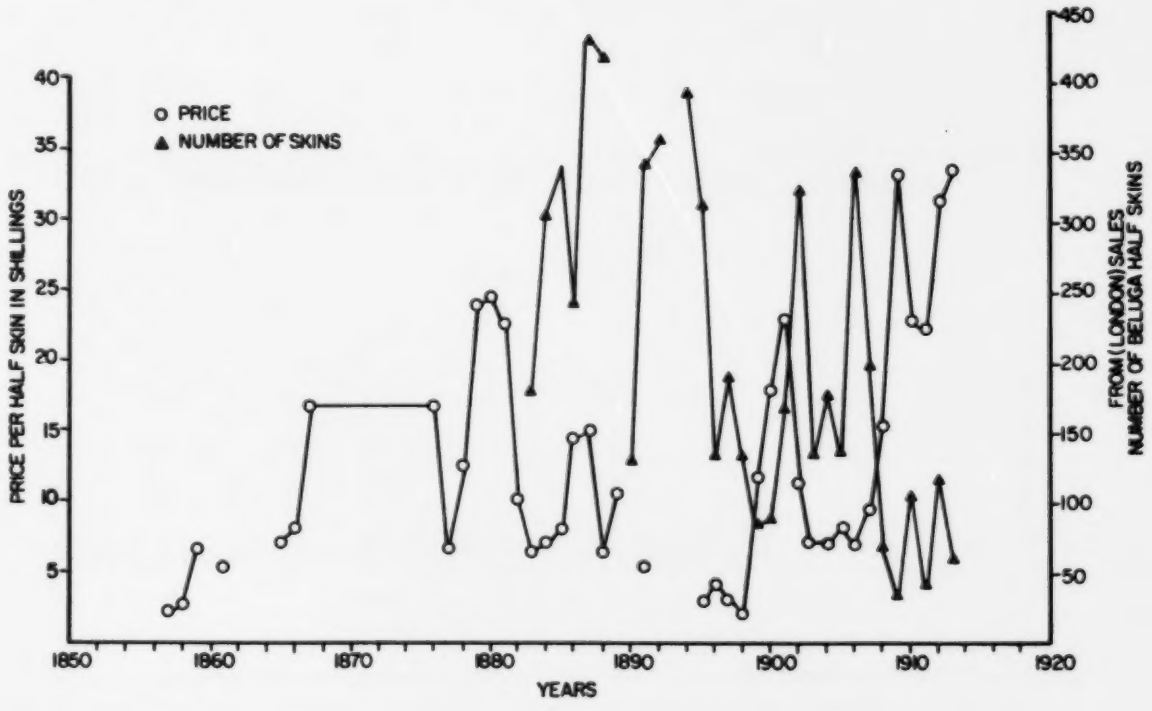



Fig. 21. Prices of beluga halfskins and number of halfskins sold on the London HBC market between 1857 and 1913.

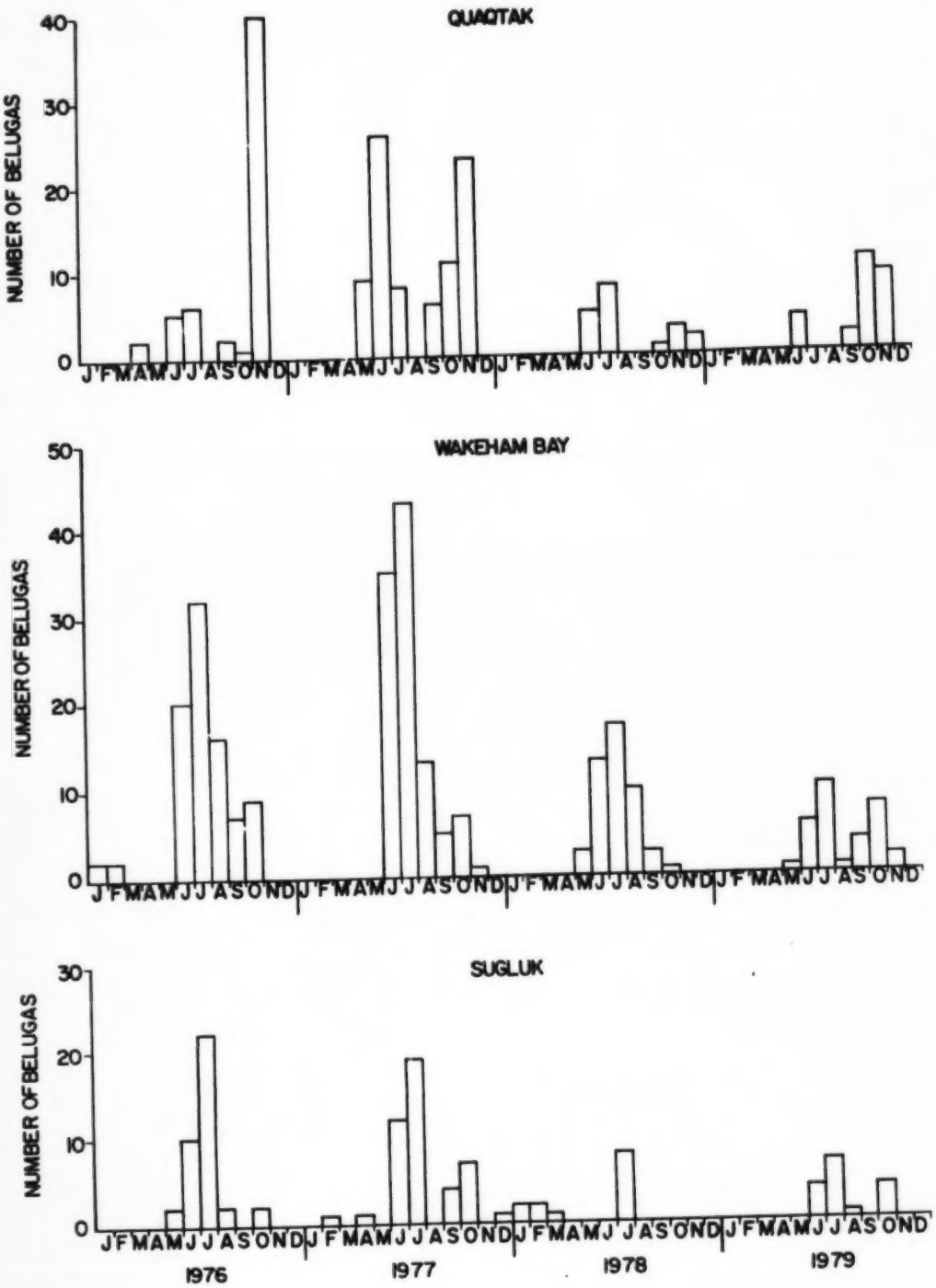

QUAQTAK
NUMBER OF BELUGAS
40
30
20
10
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
WAKEHAM BAY
NUMBER OF BELUGAS
50
40
30
20
10
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
SUGLUK
NUMBER OF BELUGAS
30
20
10
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1976
1977
1978
1979

Fig. 22. Monthly reported totals of belugas harvested at three communities along the southern Hudson Strait coast. Source: James Bay Northern Quebec Native Harvesting Research Committee. Preliminary results of research to establish present levels of native harvesting.

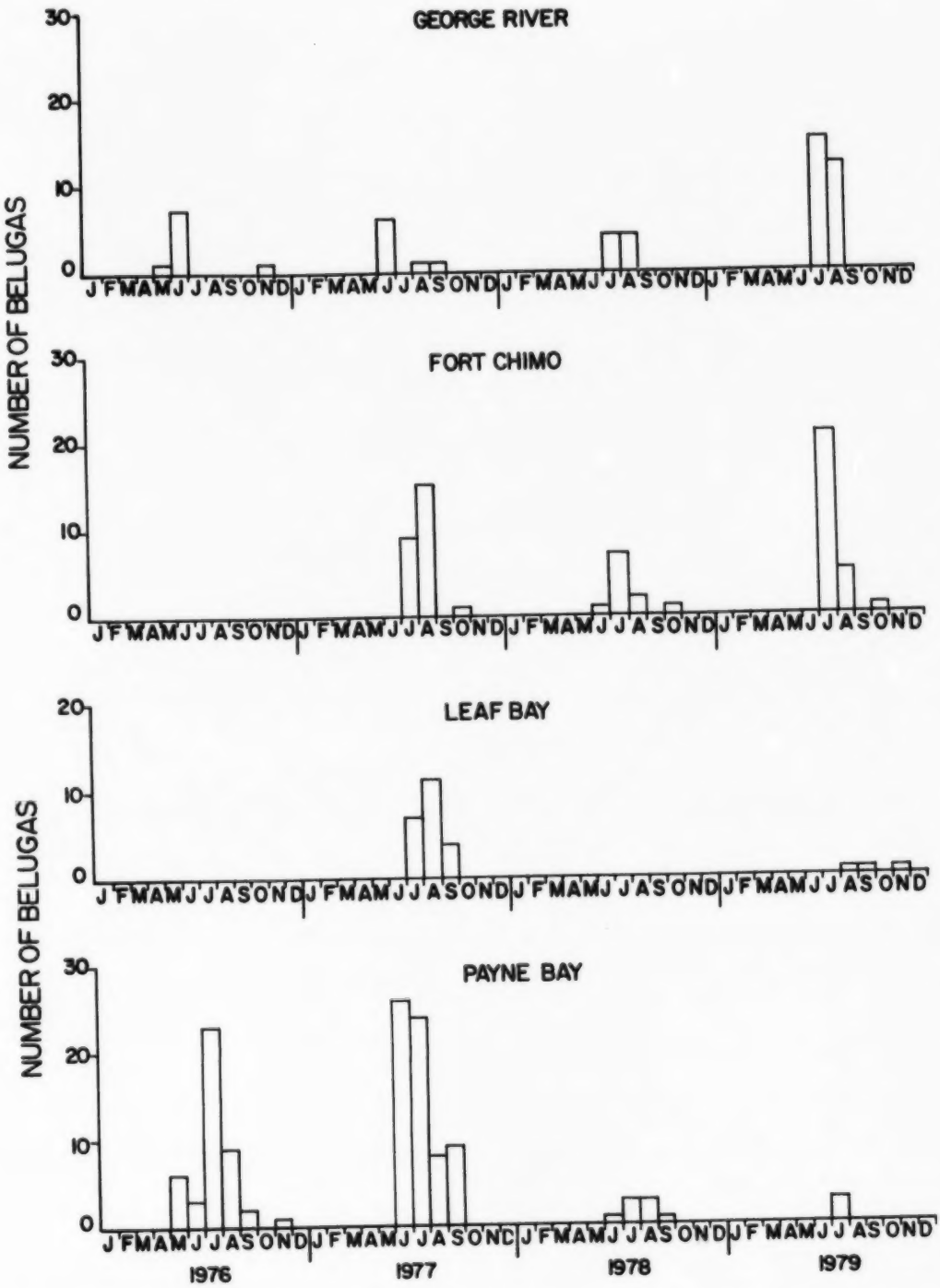

GEORGE RIVER
FORT CHIMO
LEAF BAY
PAYNE BAY
NUMBER OF BELUGAS
NUMBER OF BELUGAS
0
10
20
30
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1976
1977
1978
1979

Fig. 23. Monthly reported total of belugas harvested at four communities in Ungava Bay. Source: James Bay Northern Quebec Native Harvesting Research Committee. Preliminary results of research to establish present levels of native harvesting.

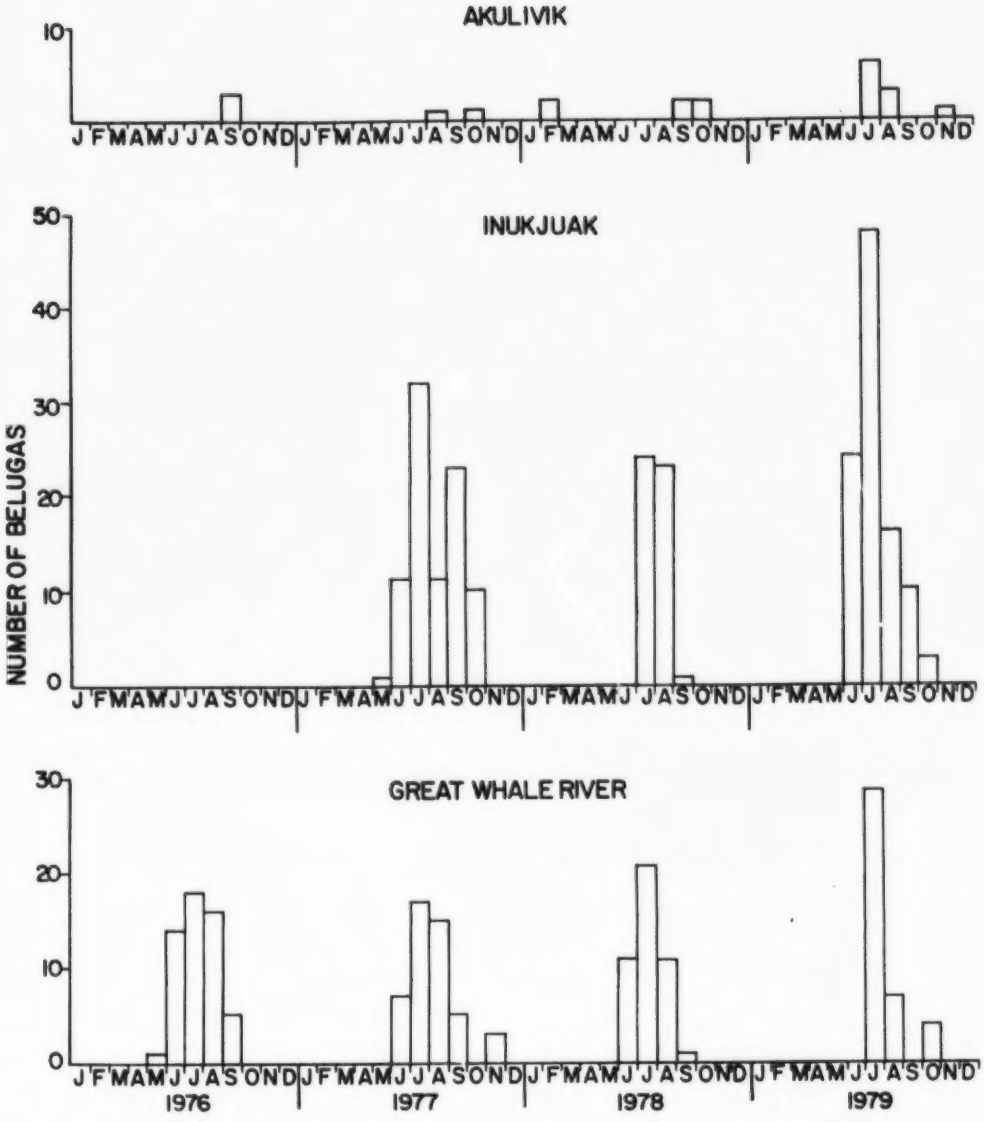

AKULIVIK
INUKJUAK
GREAT WHALE RIVER
NUMBER OF BELUGAS
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1976
1977
1978
1979

Fig. 24. Monthly reported total of belugas harvested at three communities along the eastern Hudson Bay coast. Source: James Bay Northern Quebec Native Harvesting Research Committee. Preliminary results of research to establish present levels of native harvesting.

APPENDIX 1. Accounts of belugas contained in Fort Chimo post journals, Hudson's Bay Company archives, from 3 September 1830 to 4 December 1919.

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**3 Sept 1830:** 'The sum of information that we could collect from the natives was that Deer and Partridges are numerous here, that Foxes, Wolves, Wolverines and Marten are to be seen about here, that White Whales or Porpoises are not very numerous in River and that they do not kill many in it, that they follow the ice as soon as it clear out of the rivers and bays, and kill seals and other Marine animals among it easier than in the open sea' (B38/a/1).

**20 May 1831:** 'I [Nicol Finlayson] told them that they might procure themselves guns and other useful articles if they come in the River [Koksoak] and kill Whales [belugas] during the summer season' 'Whales more numerous they say there, [Bay of Hopes Advance] than in this River [Koksoak]' (B38/a/1).

**3 June 1831:** 'They are to sound them [Eskimos] with regard to them remaining on or off this River for the purpose of killing Whales during the summer' (B38/a/1).

**5 July 1831:** 'Traded with the Esquimaux...a little bone, a pipe of oil and Blubber' (B38/a/1).

**8 July 1831:** 'They were repeatedly exhorted to exert themselves in bringing us plenty of Oil during the summer' (B38/a/1).

**13 July 1831:** 'They only brought about 40 glns oil blubber.' 'I held out to them every encouragement to remain off the mouth of the river for the purpose of killing whales, but they said they were going far off-where Foxes were numerous... they said more over that this River [Koksoak] was too deep, clear and rapid to kill whales in it in any abundance' (B38/a/1).

**17 July 1831:** '4 kyaks went a Whale fishing... return unsuccessful...although some of them had been out one day since they came into the River, only one Fish been killed' (B38/a/1).

**18 July 1831:** '2 kyaks went after whales but as usual returned unsuccessful' (B38/a/1).

**22 July 1831:** '...had killed a whale across the River...' (B38/a/1).

**23 July 1831:** The whale killed the previous day '...about 5 glns Oil-it was a young Fish' (B38/a/1).

**24 July 1831:** '...whales are as numerous in it [George River] as in this [Koksoak River].'... 'There are several small rivers between these two but none of them of any note: there are three of these which empty themselves into a deep Bay, beyond White Whale River (which is a shallow bay into which a small River falls and where the Esquimaux kill whales-they are sometimes left by the tide on the sands)...' (B38/a/1).

**26 July 1831:** 'Tried the whale fishing today but without success' (B38/a/1).

**25 Aug 1831:** 'Two kyaks were at 2 pm observed going up the River-shortly after they returned pursueing a whale-which they had harpooned' (B38/a/1).

**27 Aug 1831:** 'Those [Eskimos] whom I persuaded to go to the Eastward to kill whales were entirely unsuccessful [this season]' (B38/a/1).

**31 Aug 1831:** 'The Esquimaux were quite overjoyed when told these two men were sent off to preserve them from any sudden attack of the Indians' (B38/a/1).

**11 Aug 1832:** 'An Esquimaux killed a white whale at the Fort' (B38/a/1).

**6 July 1833:** The Eskimos traded two white whales which they had killed on the river (B38/a/1).

**6 Sept 1834:** 'Our Hunters unsuccessful except... shot a whale at Pilgrims Rest' (B38/a/2).

**1 Aug 1834:** 'Big Man killed two whales' (B38/a/2).

**3 Oct 1834:** 'I [Nicol Finlayson] have tried the whale fishing in this River [Koksoak] this season without success' (B38/a/2).

**20 July 1836:** 'The Big Man brought the blubber of a white whale he killed yesterday' (B38/a/2).

**9 July 1837:** 'The Big Man brought the blubber of two White Whales' (B38/a/5).

**22 July 1837:** '...he killed a small White Whale-the first one since he came here' (B38/a/5).

**28 Aug 1838:** D. Henderson directed to establish the George River post (B38/a/6).

**1840:** '...marine mammals very scarce [relatively speaking] in South Bay' (B38/a/8).

**1840:** John McLean resolved to abandon the George River post in 1841 and the Fort Trial post in 1842 (B38/a/8).

**19 July 1842:** '...bringing the blubber of 2 whales making 5 that he has killed this summer' (B38/a/8).

**21 July 1842:** 'Kootuck came up with the blubber of another whale' (B38/a/8).

**24 July 1842:** 'Big Man killed a whale on his way up river' (B38/a/8).

**1 Aug 1842:** '...bring the blubber of 2 whales. They [Eskimos] have been prevented by the late stormy weather from killing more' (B38/a/8).

**1 Aug 1842:** 'All the oil therefore that we are likely to procure will be from the Esquimaux of this port and the number of whales that they will kill will depend in a great measure on the state of the weather for in stormy weather they can kill more' (B38/a/8).

**14 Aug 1842:** 'Big Man came up with blubber of 2 whales' (B38/a/9).

**15 Aug 1842:** 'Kootuck killed 2 whales' (B38/a/9).

**31 Aug 1842:** 'Blubber from 1 whale to trade' (B38/a/9).

**18 Sept 1866:** Joseph MacPherson reopened the Fort Chimo post (B38/a/9).

**8 Oct 1866:** 'They [Eskimos] coroborate the accounts before given us of the salmon being abundant, and the porpoises they say are even more numerous now than they were when the whites were here before' (B38/a/9).

**19 June 1867:** 'They [Eskimos] report that the white whales have made their appearance at the mouth of the river, one has already been killed by them' (B38/a/9).

**8 July 1867:** 'We see no porpoises but they may pass on the other side of the river unobserved by us' (B38/a/9).

**10 July 1867:** 'No porpoises to be seen' (B38/a/9).

**11 July 1867:** 'The Esquimaux have brought some white whale fat, the first they have killed this season' (B38/a/9).

**16 July 1867:** 'I [Joseph MacPherson] went down the river and saw a place where I think that we might get porpoises in nets' (B38/a/9).

**18 July 1867:** 'Men are employed at making the porpoise net' (B38/a/9).

**20 July 1867:** Netted a porpoise. 'This fish measured 16 feet and yielded nearly 2 tierces of blubber. Had we netting material to work with I have no doubt that we would catch during the summer over 100 porpoises...' (B38/a/9).

**22 July 1867:** From this date until 28 July 1867 the men netted eight whales in all (B38/a/9).

**29 July 1867:** 'I went with the men to the Porpoise net, we got two and found the net more than usually broken' (B38/a/9).

**30 July 1867:** 'Two boats of Esquimaux arrived... got no porpoises' (B38/a/9).

**31 July 1867:** 'Nothing from the net, altho a good many porpoises are still to be seen. The Cooper employed with the oil. The Esquimaux have only killed three porpoises since they were here and we have now got ten with our short net' (B/38/9).

**1 Aug 1867:** 'We got another white whale today but there are very few whales to be seen at present altho the Esquimaux say that they will be a long time about the river yet' (B/38/9).

**2 Aug 1867:** 'Got the Esquimaux women to cut up our fat' (B/38/9).

**3 Aug 1867:** 'Got nothing, they took it up, as I propose sending it down to the mouth of the river and to be fished by the Esquimaux' (B/38/9).

**20 Aug 1867:** 'Got one whale with Esquimaux' (B/38/9).

**21 Aug 1867:** 'Nothing in whale net' (B/38/9).

**22 Aug 1867:** 'An Esquimaux got another whale' (B/38/9).

**24 Aug 1867:** 'Shifted whale net' (B/38/9).

**25 Aug 1867:** One white whale was caught (B/38/9).

**26 Aug 1867:** '...no whales today' (B/38/9).

**16 Sept 1867:** 'Took up the nets' (B/38/9).

**1 July 1868:** 'Saw a great many porpoises below MacKay's Island but none seen this far as yet' (B/38/9).

**4 July 1868:** 'Finished the lacing of a porpoise net of double salmon twine. A good many porpoises were seen passing today' (B38/a/10).

**6 July 1868:** 'Set two porpoise nets' (B38/a/10).

**8 July 1868:** 'No sign of any porpoise today' (B38/a/10).

**11 July 1868:** 'Nothing yet from our porpoise nets. Esquimaux arrived from below in kayaks with a little blubber' (B38/a/10).

**12 July 1868:** 'No whales to be seen' (B38/a/10).

**13 July 1868:** 'Lost another porpoise today by breaking through the net' (B38/a/10).

**14 July 1868:** 'We got one porpoise this morning at last.' 'No porpoises were seen up here today altho a great number were seen yesterday' (B38/a/10).

**15 July 1868:** 'Munro's party at Whale Cove got another porpoise today and another broke through the net' (B38/a/10).

**16 July 1868:** 'Munro's party got another porpoise and Richards also got one' (B38/a/10).

**17 July 1868:** 'Richards' party got 2 Porpoises today' (B38/a/10).

**18 July 1868:** One porpoise was caught (B38/a/10).

**20 July 1868:** 'One party to tend nets as there are so few porpoises taken' (B38/a/10).

**23 July 1868:** No porpoises were caught (B38/a/10).

**24 July 1868:** 'Esquimaux brought about 1 1/2 trs oil' (B38/a/10).

**25 July 1868:** 'No porpoises lately.' McLean sent Richards to see if porpoises went up False River (B38/a/10).

**27 July 1868:** 'Got one small porpoise' (B38/a/10).

**29 July 1868:** '4 Esquimaux arrived with about 200 lbs blubber'(B38/a/10).

**31 July 1868:** 'Men returned without anything from porpoise fishery' (B38/a/10).

**1 Aug 1868:** 'Richards returned from False River his report of porpoises in that quarter is not favourable' (B38/a/10).

**9 Aug 1868:** 'Very few porpoises to be seen at present' (B38/a/10).

**28 June 1869:** A 36 FMS long porpoise net was set up at Whale Cove. 'I [Peter McKenzie] set the net quite differently from the way they were last year. At noon we got a porpoise. We saw only two others' (B38/a/10).

**29 June 1869:** 'No whales were seen today. 500 lbs of the twine only made one net 40 FMS long and 24 mesh deep-it doesn't run at all-it is very unprofitable' (B38/a/10).

**30 June 1869:** '...to set two 40 FMS nets for porpoises about 2 miles below Whale Cove' (B38/a/10).

**2 July 1869:** 'We set the two nets but no porpoises came near them. They all passed in the middle of the river' (B38/a/10).

**3 July 1869:** 'Three whales made to within 6 ft of one of our nets and turned right back. They are very much afraid of nets. So many of them having got through them last year' (B38/a/10).

**6 July 1869:** 'Helped him to change the position of the nets. The whales have been close to them several times but will not strike them. The twine is so large they can see the net quite plain and turn immediately' (B38/a/10).

**7 July 1869:** 'Boman got a whale today, the first that has been seen so far at his place since he got the last one' (B38/a/10).

**11 July 1869:** 'No whales seen up this river, Richards has frightened them away altogether I am afraid. I never saw such shigh [sic] fish in my life. [On the 9th he had directed Richard to take up his nets as he was only frightening the whales coming to Boman]' (B38/a/10).

**13 July 1869:** 'Boman got 3 Porpoises today all large ones-quite a number of porpoises at Richards' place' (B38/a/10).

**14 July 1869:** 'Plenty of porpoises near Boman's net but they are beginning to be rather afraid of the net' (B38/a/10).

**16 July 1869:** 'The young men [Eskimos] went after the whales in their Cayaks frightening them off' (B38/a/10).

**28 July 1869:** 'Boman got a porpoise, another got away' (B38/a/10).

**20 July 1869:** 'Set all our fishery and succeeded in shutting in about 15 porpoises but they did not remain in, instead of being afraid of the poles set up outside to keep them in they all made a rush at them and went right through' (B38/a/10).

**21 July 1869:** 'Took up our nets and poles. The porpoise won't go near Boman's nets either' (B38/a/10).

**30 July 1869:** 'There is great quantities of ice along the coast' (B38/a/10).

**31 July 1869:** 'Boman has caught no whales since there are scarcely any to be seen now' (B38/a/10).

**2 Aug 1869:** 'He [Boman] has his whale net set about 2 miles below Whale Head, there are plenty of whales but they won't go into his net' (B38/a/10).

**4 Aug 1969:** 'No whales to be seen in the river [Koksoak] at all' (B38/a/10).

**23 Sept 1869:** '...our attempt this summer to catch porpoise has entirely failed owing to our not having a sufficiency of nets to make a proper fishery for them...fortunately we had some Trawl and Seal Twine out of which I [Peter McKenzie] made a net 36 FMS long and 5 FMS deep by doubling the former, and using the latter single; in this net we caught 6 Porpoises-the other one was set the whole season also, at different places on the River but tho we could see the Porpoises going direct for it, they would turn right back as soon as they got within 20 ft of it so that we are quite convinced that the largeness of the twine is the sole cause of them not meshing-Seal Twine such as we got last year is the exact size for them, it runs well, and it is plenty strong enough. The six that we got in the Seal Twine Net did not break any part of it tho there were three large ones in it at one time. I made a

fishery for them partly with nets and the remainder with poles in which I shut up about 20 by heaving up the nets from off the bottom with Capstans. I thought that when they were once shut in that the poles would frighten them into the nets, but instead of being afraid of the poles, as soon as they perceived that they were shut in they all made a rush and went out through the poles, we could see them going above the net under water, and when they reached the beginning of the poles went right through without the least hesitation, the poles were barked and appeared white in the water being perceptible at a considerable distance. They were planted about two feet apart' (B38/b/4).

**23 Sept 1869:** 'It is not my opinion that a great many Fish [belugas] will ever be killed in this river [Koksoak] with nets. Where our fishery was situated is the only likely looking place in it so far as I can judge and it is very small as you will see by my sketch, there is no other place where there is so little tide, and where the whales can pass so near the shore' (B38/b/4).

**23 Sept 1869:** 'I think that with what we have at present a fair haul can be made on a small scale, which if it fails will be a sufficient proof that there will be no better prospect on a larger scale' (B38/b/4).

**23 Sept 1869:** 'They [Eskimos] never kill many porpoises, [at Leaf River]. One who has been hunting there all summer has only killed 6 and he is considered a very good hunter' (B38/b/4).

**23 Sept 1869:** 'They [Eskimos] complain very much at the prices given them for fat [both seal and whale]. They think it very little (20 Cts for 15 lbs). I think myself that it is as much as the company can afford to give' (B38/b/4).

**6 July 1870:** 'No porpoises to be seen as yet' (B38/a/11).

**11 July 1870:** 'They [Eskimos] saw a number of porpoises the first seen this season as far up as this. As soon as the spring tides are done we will set our fishery for them once more' (B38/a/11).

**12 July 1870:** 'Saw no whales' (B38/a/11).

**16 July 1870:** 'Saw a number of porpoises going up the river [Koksoak] about 10 am' (B38/a/11).

**18 July 1870:** Nets set (B38/a/11).

**29 July 1870:** 'Since the 18th last we have been enabled only to shut in 10 porpoises (one of 8 and one of 2)' (B38/a/11).

**1 Aug 1870:** 'Shut in half a dozen--all escaped except a small one.' The nets break with a strong tide (B38/a/11).

**7 Aug 1870:** 'No whales caught as yet' (B38/a/11).

**15 Aug 1870:** 'Took up whale net as he can catch none in it' (B38/a/11).

**12 July 1871:** 'We examined Whale River as high up as the rapids but did not find any very advantageous place for setting whale nets. There is only one place at the first narrows where a fishery might be set but the whales don't seem to frequent it except during spring tide. It was neap tides while we were there, the whales kept to the middle of the river [Whale River] and did not come near the shore at all' (B38/a/11).

**19 July 1871:** No whales (B38/a/11).

**23 July 1871:** 'No whales to be seen up this far yet' (B38/a/11).

**25 July 1871:** Nets set (B38/a/11).

**1 Aug 1871:** 'Took up nets without having seen a whale near it' (B38/b/11).

**27 Sept 1871:** '....the porpoise fishery...has proven an entire failure. Summer '70 I set a net standing fishery for them in the same place that I had it in the previous season. I had it down 14 days, during which time we only succeeded in shutting in 11 and got those by hiring an Esquimaux to drive them into the fishery as they would not go near it on their own accord. This summer I set the fishery again but the porpoises would not come near or be driven in' (B38/b/4).

**11 Sept 1872:** 'As we had no boat we did not try the porpoise fishery this season' (B38/b/4).

**Sept 1873:** 'I did not try the porpoise fishery again this season, the salmon came in so early that I had to prepare for them' (B38/b/4).

**Sept 1880:** '...but I kept the porpoise nets in the water until the 20th August which considerably added to the quantity of oil, and will I hope compensate for the haul of salmon' (B38/b/5).

**1 Sept 1881:** 'Only 33 porpoises were taken this summer. The Esquimaux disappointed me in not coming from the seal hunt as usual and the arrival of the 'Diana' compelled me to take up the nets 3 weeks earlier than last year' (B38/b/5).

**25 Aug 1882:** 'The porpoise fishery has not been very successful--only 38 having been taken. I had a sufficient crew of Esquimaux to drive them but the porpoises are becoming too well aquainted with the efforts and this season they invariably turned and went down the river before they got as far up as the fishery.' 'It is a pity that such a place as George's River should be left vacant by the Company...no attempts have ever been made by the Companys' people to fish salmon or porpoises at George River and it is well known that both fish are there in great numbers' (B38/b/5).

**6 Sept 1883:** 'We caught 83 whales this summer which I think was very good considering that we had only 3 Esquimaux to assist us and were obliged to drive the whales with the steam launch.' 'The oil to be shipped on account of this outfit [1883] is entirely our own catch as no oil has been obtained from the Esquimaux this summer. The shipments this season compare favourably with other years' (B38/b/5).

**12 March 1884:** John Ford erected buildings at George River (B38/b/5).

**13 June 1884:** 'As soon as possible you [John Ford] will set out for George River to the charge of which post you are appointed...carrying on the salmon fishery as vigorously as possible' (B38/b/5).

**1884:** The setting up of whale fisheries at Leaf and Whale Rivers is considered (B38/b/6).

**1 Sept 1885:** 'We caught 82 whales and filled all the casks we had left' (B38/b/6).

**26 Aug 1886:** 'We got 90 whales, which just filled all the tanks we had there [Whale River]' (Fished whales there this season for the first time)' (B38/b/6).

**1886:** 'Whale River-the only business there, to be, the catching and curing of salmon, whale fishing...there is no trade...' (B38/b/G-137).

**5 Sept 1886:** Packing Accounts for Furs, etc.

| | | |
|---|---|---|
| 46 tierces | pale porpoise oil | 1656 Glns |
| 16 tierces | pale seal oil | 576 Glns |
| 172 sides | porpoise skins | |

**15 Sept 1886:** Packing accounts for Salmon, Oil, etc. for the S.S. 'Diana' (B38/b/6).

| | | |
|---|---|---|
| 6 tierces | pale seal oil | 216 Glns |
| 7 tierces | boiled porpoise oil | 252 Glns |

**15 Sept 1887:** 'I fished whales in this river and got 84, the usual number. The Fox was sent to Leaf River to fish there but...they could not set a proper fishery' (B38/b/7).

**17 Sept 1887:** Accounts

| | | |
|---|---|---|
| 6 H'Hds | pale porpoise oil | 348 Glns |
| 33 tierces | pale porpoise oil | 1188 Glns |
| 8 tierces | boiled porpoise oil | 288 Glns |
| 5 tierces | pale seal oil | 180 Glns |
| | Total | 2004 Glns |

(B38/b/7).

**28 Sept 1887:** 'I visited Leaf River in June... there are plenty of whales there but it is a very bad place to get at and the price of oil and skin is so low, that I do not think it is worth while to fish it' (B38/b/7).

**11 Sept 1888:** 'The whole fishery is not so good as last year although we tried two rivers instead of one this season. The weather was so windy that we could scarcely get a day in which we could drive the whales into the nets; we have, however, about the same quantity of oil in the district as last year' (B38/b/7).

**11 Sept 1888:** 'We fished whales both in this and Whale River but were not very successful. We got 30 whales at Whale River and Saunders and Miller fished here and got 42' (B38/b/7).

**11 Sept 1889:** Accounts

| | | | | |
|---|---|---|---|---|
| 141 sides | porpoise oil | | Value | 85/4" |
| 39 tierces | pale porpoise oil | 1404 Glns | | |
| | pale seal oil | 468 Glns | | |
| | Total | 1872 Glns | | 118/19" |

(B38/b/7).

**Sept 1889:** 'The whale fishery in this river [Koksoak] is rather better than it has been for [illegible] years. We got 150 whales, but at Whale River where we also had a fishery for them only 10 were captured. The gate of the fishery got foul of a rock and when attempted to be lifted could not be moved letting about 40 whales out. We could have kept on fishing for whales... and I [McKenzie] have no doubt might have captured over 200 on this river [Koksoak]' (B38/b/7).

**16 Sept 1890:** 'The whale fisheries were carried on as usual both at this place [Koksoak] and at Whale River in the month of July. Only 52 whales were taken at his place and none at Whale River and I think it would be well to discontinue this branch of the business at the latter places for a year or two' (B38/b/7).

**18 Sept 1891:** 'The whale fisheries here have I [Duncan Matheson] am sorry to say been a failure. The last season at Whale River having had such poor results I decided not to fish there this summer and sent Edmond with the Fox and nine nets to Leaf River and I am glad to say the trip was very successful. Edmond left here on the 17th of July and returned on the 10th of August with the blubber and skins of 72 whales. He reports whales as very numerous and had no difficulty in drawing them into nets. At this place [Port Chimo] we only caught five whales. The river has now been fished continuously for the last 18 or 20 years and I am of the opinion it would be well to discontinue fishing for a couple of seasons and confine our operation to Leaf River' (B38/b/7).

**Sept 1892:** 'Our oil returns are somewhat better than those of last outfit but less than I had expected-we were only able to make one trip to Leaf River' (B38/b/7).

**1894:** 'I [Matheson] regret to say that our fisheries have been a complete failure this season' (B38/b/7).

16 Sept 1895: 'This branch of the business [whale fisheries] was a total failure this season. The nets were set 1st of July and operations carried up to the beginning of August. Porpoise are fairly numerous but so shy and wary that the least noise would frighten them out to sea where they would remain for days before returning to the river. The Fox made her usual trip to Leaf River this summer in charge of John Mills who had fair success returning here on the 10th with the fat and skins of 60 whales. At this place [Fort Chimo] the catch was only 10 porpoises.

12 Sept 1896: 'The fisheries have been complete failures this season. The whale fishery owing to the stormy weather that prevailed all summer' (B38/b/7). 'The catch of porpoises at Leaf River was only 20 and 35 here [Koksoak]' (B38/b/7).

1897: 'The whale fisheries were not very successful. The catch was eight porpoises. No operations were carried on at Leafs River' (B38/b/7).

Sept 1898: 'The whale fishery failed' (B38/b/7).

1899: 'This seasons operation was confined to Leaf River. The catch was only 36 porpoises' (B38/b/7).

1900: 'Operation confined to Ungava River [Koksoak River] the catch being only 21 porpoises' (B38/b/7).

1901: 'These fisheries [whale fisheries] have not yielded profitable results for some years. This season our operations were confined to the Ungava River...only four porpoises' (B38/b/7).

12 Sept 1902: 'The Fox was sent over to Leaf River but the catch there was only 11 porpoises, while in this river [Koksoak] also 11 were obtained (10 from the nets and one killed by an Esquimaux). Re nets: some made as far back as 1870 or 1876. I [Wilson] hope we shall yet make something of a fishery. The whales are still very numerous in both rivers and must play frightful havoc among the salmon at certain seasons' (B38/b/7).

12 Sept 1902: 'The returns of the fisheries at Port Burwell last fall amounted to 900 seals, 14 porpoises and 1 walrus, which will give a good collection of oil, the best since the establishment of the place' (B38/b/7).

19 Sept 1903: 'Caught only three porpoises and I have decided to discontinue this fishery for a few seasons at least' (B38/b/8).

10 July 1906: '...sending whale nets to George River' (B38/b/8).

July 1906: 'Mr. Ford informs me [Stuart Cotter] that large schools of porpoises ascend the George River as they have not been driven as they have been here [Koksoak River]. I am in the hopes the fishery will prove remunerative' (B38/b/8). It is noted that in the fall of 1905 60 white whales were caught at Cape Chudleigh (B38/b/8).

9 Sept 1907: The whale fishery at George River 'a failure' (B38/b/8).

1907: Annual Report: 'With regards to the whale fishery the best of the old gear which was formerly employed in the fisheries at Leaf River and this post has been sent to George River post....If unsuccessful [at George River] we could if necessary start the fishery again at Leaf River' (B38/b/8).

25 July 1908: 'Esquimaux from north arrived with considerable quantity of oil' (B38/b/8).

11 Sept 1908: '...our oil catch was more than successful' (B38/b/8).

1909: '..a very marked decrease in the returns of oil compared with 1908' (B38/b/8).

13 Dec 1911: 'Reports on Hudson's Bay Company Sale.'

'Porpoise, salted-remains in very good demand the few half-skins received from Great Whale River realized an average of 23/8 each and the 10 from Ungava 21/- each.'

16 Jan 1913: 'Report on the Hudson's Bay Company Sale.'

'Porpoise, salted-met with better competition. The GWR [Great Whale River] skins which were not in as good condition as those sold under the U [Ungava] mark declined nearly 5% realizing low averages of about 22/9 per half skin.'

4 Dec 1919: 'Report on Sale of salted hides.' 'At last years sale [19 September 1918] some 132 salted porpoise hides and sides (half hides) realized from 1/8d to 2/7d per lb, in average say 2/3 1/2d per lb. This year 273 salted whitefish sides fetched from 1/4d to 2/8d per lb or an average of 2/6 1/2d per lb., dry porpoise realized 3/- per lb.'

APPENDIX 2. Accounts of belugas contained in George River post journals, Hudson's Bay Company archives, from 1898-1911.

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1898-1911: No accounts of belugas were found in the post journals for this period. Most of their enterprise was devoted to the salmon fishery.

APPENDIX 3. Accounts of belugas contained in Wolstenholme post journals, Hudson's Bay Company archives, from 20 September 1909 to 5 October 1922.

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19 Nov 1909: 'Total catch from our 2 nets this fall was six porpoises.' [From 20 September to 6 November.] (B368).

Sept 1910: There are accounts of six white whales being taken from the nets between 5 and 23 September (B368).

Sept 1911: There are accounts of 10 white whales being taken from the nets between 12 and 30 September (B368).

Oct 1911: There are accounts of eight white whales being taken from the nets between 18 and 20 October (B368).

20 Oct 1911: 'Shifted net from the cove to the gulch below as that seems to be the best place for porpoises' (B368).

28 Oct 1911: 'Saw a white whale today' (B368).

12 Aug 1912: Lost two white whales (B368).

17 Aug 1912: Five white whales were caught (B368).

Sept 1912: There are accounts of five white whales being taken from the nets and three more being shot between 4 and 28 September (B368).

17 Sept 1912: 'The harbor for a time was literally full of them [whales]' (B368).

18 Sept 1912: 'Some white whales in the harbor again today but we did not get any of them as the nets had to be taken up yesterday being full of holes' (B368).

Oct 1912: There are accounts of 10 white whales being taken from the nets between 1 and 9 October (B368).

12 Oct 1912: 'Arrivals from camp #2 report no whales' (B368).

4 Aug 1913: The first four white whales of the year were caught (B368).

Aug 1913: 11 white whales were caught this week (B368).

14 Aug 1913: 'The whales seem to have left us altogether now as we have got none at all this week' (B368).

15 Aug 1913: Two white whales were caught (B368).

25 Aug 1913: One white whale was caught (B368).

Sept 1913: There are accounts of seven white whales being taken from the nets between 1 and 20 September (B368).

25 Sept 1913: an Eskimo shot one white whale in the cove (B368).

26 Sept 1913: '2 nets completely destroyed by a large school of whales' (B368).

Oct 1913: Accounts of four white whales taken in early October (B368).

Sept 1914: Accounts of eleven white whales taken during the month (B368).

Oct 1914: Four white whales taken in nets in early October (B368).

2 June 1915: White whales hides were salted (B368).

13 July 1915: White whale hides were salted (B368).

3 Aug 1915: 'Visited whale nets and got 3 white whales' (B368).

5 Aug 1915: 'Visited whale nets and got 3 whales but they were very small' (B368).

11 Aug to 9 Sept 1915: Eight white whales were taken from the seal nets (B368).

11 Sept 1915: 'Today several large schools of whales were [illegible] the shore. Shot 9 and got 7 of them, several others badly wounded but got away' (B368).

18 Sept 1915: To the end of September six white whales were taken in nets (B368).

11 Oct 1915: 'Porpoise are apparently fairly plentiful round there for these people traded about 14 today' (B368).

21 July 1916: 'Caught and secured one porpoise, the first for the season' (B368).

22 July 1916: 'Caught and secured one porpoise from Bear Cove net' (B368).

24 July 1916: 'We have now 7 whales in 4 days' (B368).

28 July 1916: 'Caught and secured 5 porpoises - 3 from Bear Cove' (B368).

31 July 1916: Secured one porpoise (B368).

1 Aug 1916: 'Natives report porpoise to be very scarce at their hunting grounds' (B368).

Aug 1916: There are accounts of nine white whales being taken from the nets [two from Bear Cove]

and of the trading of two hides between 2 August and 26 August (B368).

**29 Aug 1916:** 'Natives report porpoise to be a little more plentiful at their camp than they were the last visit' (B368).

**Sept 1916:** There are accounts of three whitewhales being caught and 22 being traded between 5 and 26 September (B368).

**25 Sept 1916:** 'The porpoise is the largest ever caught at Wolstenholme measuring 22 feet in length' (B368).

**27 Sept 1916:** 'The porpoise that was spoken of in Mondays log to be the largest ever caught at Wolstenholme. The weight of hide 67 lb. valued at $21.00, not bad for one porpoise' (B368).

**28 Sept 1916:** Nine white whales were traded. 'Natives report porpoise very plentiful along by their camp.' 'To date we have 102 porpoise and if they keep on as they are for another month we will have very little under 200 porpoises' (B368).

**6 Oct 1916:** 'Quite a few porpoise were seen in the harbour this afternoon. They were well out and it was too stormy to go after them' (B368).

**7 Oct 1916:** 'Porpoise were seen again today in harbour but they keep well in deep water and don't go near our nets' (B368).

**9 Oct 1916:** One white whale was caught (B368).

**10 Oct 1916:** 'A porpoise was seen along the shore this afternoon. We shot it 3 times but it managed to get off in deep water' (B368).

**14 July 1917:** 'A large school of porpoise was seen in harbour' (B368).

**20 July 1917:** 'There was a big school of porpoise in the harbour today, the place seemed to be full of them. Altogether we killed and wounded about 14 of them but only managed to get one. The rest got out to deep water and sunk' (B368).

**21 July 1917:** Accounts of 17 white whales being caught between 18 July and 28 July (B368).

**31 July 1917:** Four white whale hides were traded (B368).

**2 Aug 1917:** 'A large school of porpoise were in the harbour last evening and most of them passed through our net leaving 2 of them so much that they are wholly unfit to go in the water again'. 'Shot 3 whales and a lot of others were wounded but managed to get off to deep water' (B368).

**3 Aug 1917:** Accounts of eight white whales being caught between 2 August and 9 August (B368).

**11 Sept 1918:** 'Caught and secured 2 large porpoise, the first for this season' (B368).

**24 Sept 1918:** 13 white whales were traded (B368).

**28 Sept 1918:** Three white whales were caught (B368).

**1 Oct 1918:** Three white whales were caught (B368).

**31 Oct 1918:** 'Took up our net - 1 small porpoise' (B368).

**11 June 1919:** 'First school of whales seen in harbour' (B368).

**16 Sept 1919:** 'Shot one whale today' (B368).

**24 Sept 1919:** The first white whale was caught in a net (B368).

**4 Oct 1919:** 'Arrivals had 290 lbs. porpoise hides - they report plenty of porpoise over there [at the Islands]' (B368).

**9 Oct 1919:** Arrivals brought in over 200 lbs. of white whale hides (B368).

**4 June 1920:** 'Quite a few whales have been killed over there [at the Islands] lately and they tell us that there is very little ice on the Strait' (B368).

**13 July 1920:** 'A large number of porpoise were seen in harbour this afternoon' (B368).

**31 July 1920:** A white whale was wounded (B368).

**1-5 Oct 1920:** Some white whales were traded (B368).

**3 June 1921:** White whales were packed (B368).

**15 Sept 1921:** 'Report numerous porpoise near their camp' (B368).

**5 Oct 1921:** Whale hides were secured (B368).

**18 Aug 1922:** 'We got 2 white whales in our net today' (B368).

**21 Sept 1922:** 'Whales are very plentiful over there [at the Islands]' (B368).

**27 Sept 1922:** Three white whales were taken from the nets (B368).

**5 Oct 1922:** Traded white whale hides (B368).

**APPENDIX 4.** Accounts of belugas contained in Stuparts Bay post journals, Hudson's Bay Company archives, from 7 November 1914 to 1 July 1938.

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**7 Nov 1914:** '....trade stores and dwelling house were put up.' '....having only got 3 white whales before our net was torn up and the ice was beginning to make' (B484/a/1-13).

15 Nov 1914: 'Ice solid in Harbor' (B484/a/1-13).

22 June 1915: 'Parsons employed salting porpoise hides' (B484/a/1-13).

12 July 1915: 'This evening at 6:30 many porpoises were in harbour and close to shore....shooting at them none were killed' (B484/a/1-13).

22 Sept 1915: '....unless whales soon strike in we shall be short of dog food again this winter' (B484/a/1-13).

24 Sept 1915: 'Porpoises in considerable quantities were seen in bay today' (B484/a/1-13).

28 Sept 1915: Secured 2 porpoises (B484/a/1-13).

4 Oct 1915: 'Secured 1 porpoise. To date we have 6 porpoises...from the nets this fall but we hope to get another 10 porpoises before being compelled to take up our nets' (B484/a/1-13).

19 Oct 1915: Two whale nets taken up. Two more white whales were secured (B484/a/1-13).

17 July 1916: '....traded 1 white whale' (B484/a/1-13).

21 July 1916: 'Several porpoise came up the harbour today but we did not get any' (B484/a/1-13).

25 July 1916: "Mukkeguk has arrived with the 'cheerful' news that his net has been torn completely by a school of whales as he reports them very plentiful over there we have give him enough twine to make another net in the hope of getting some of them." (B484/a/1-13).

6 Oct 1916: 'Natives traded some porpoise.' 'Porpoise are said to be very scarce outside at present' (B484/a/1-13).

10 Oct 1916: 'Net contained half a porpoise, a shark having eaten the rest' (B484/a/1-13).

4 Nov 1916: A white whale hide was traded (B484/a/1-13).

21 July 1917: Four white whales were traded (B484/a/1-13).

24 July 1917: 'Arrivals traded some porpoise' (B484/a/1-13).

28 July - 26 Sept 1917: There are 14 accounts of Eskimos trading white whales (B484/a/1-13).

26 Sept 1917: 'Got 3 [whales] yesterday from nets up the bay' (B484/a/1-13).

17 Oct 1917: 'Whale net torn up by shark' (B484/a/1-13).

17 Oct 1917: There are accounts of three white whales being taken in the nets between 5 and 27 October (B484/a/1-13).

17 Oct 1917: There had been two whales in the net but only half of one was left - eaten by sharks (B484/a/1-13).

Oct 1917: There are three accounts of Eskimos trading white whale hides between 18 October and 29 October (B484/a/1-13).

26 Oct 1917: Pallisser shot a whale (B484/a/-1-13).

31 July 1918: Onninalook traded 1/2 porpoise hide (1st of the year) (B484/a/1-13).

9 Aug 1918: There are three accounts of Eskimos trading white whale hides between 9 August and 23 August (B484/a/1-13).

12 Aug 1918: 'Very few porpoise are being got' (B484/a/1-13).

3 Sept 1918: 'No whales have been seen, or walrus....' (B484/a/1-13).

9 Sept 1918: Onninalook traded a whale hide (B484/a/1-13).

31 May 1919: 'Returns for this outfit - 15 porpoise hides' (B484/a/1-13).

6 July 1920: 'Traded 2 whale hides today' (B484/a/1-13).

13 July 1920: 'White whales were very plentiful here in the bay at night' (B484/a/1-13).

14 July 1920: 'Exetook's boat arrived with a few whales aboard.' 'We got a small whale in our net (250 lbs.)' (B484/a/1-13).

19 July - 13 Aug 1920: 47 half hides were brought in during this period. This information extracted from 8 accounts of trading (B484/a/1-13).

5 Aug 1920: 'Pallisser shot a whale that was in our net' (B484/a/1-13).

6 Aug 1920: 'The whale were numerous here in the "Bay"' (B484/a/1-13).

19 Aug 1920: 'Sargeuk shot a whale up in the bay today' (B484/a/1-13).

18 Aug 1930: 'Several whales were seen today in the bay but none were caught' (B484/a/1-13).

1 Oct 1930: 'The whales were cut up at high tide in the evening' (B484/a/1-13).

17 June 1931: 'Elecetook brought in a whale hide today' (B484/a/1-13).

28 June 1931: 'A whale or 2 made their appearance in the bay tonight, and there is no ice to be seen' (B484/a/1-13).

9 June 1931: 'There were several whales close in shore tonight' (B484/a/1-13).

10 July 1931: Preparations were made for a fortnight's trip over to Stupart's Bay where lots of whales were reported (B484/a/1-13).

15 July 1931: 'Word from Stupart's Bay that 6 whales had been caught in the nets but owing to the presence of lots of ice the second net was not yet fixed' (B484/a/1-13).

18 July 1931: 'We heard that the whaling operations over at Stupart's Bay had been very successful and 9 whales are reported to have been caught in the nets and 3 shot making a total of 12 in all' (B484/a/1-13).

21 July 1931: Commenced bundling the whale hides for shipment (B484/a/1-13).

23 Aug 1931: 'Sangeuk's boat returned tonight with 2 whales.' 'Several whales were seen in the bay tonight' (B484/a/1-13).

15 Sept 1931: 'Whale hides merchandise for D.O. reserve were put aboard by Sangeuks boat during the forenoon' (B484/a/1-13).

24 June 1933: 'The first 2 whales were killed last week over at Stupart's Bay' (B484/a/1-13).

20 July 1933: They went to Fisher Bay for whales (B484/a/1-13).

9 Aug 1933: Hides were salted (B484/a/1-13.).

8 Oct 1934: 'There were very many white whales in the harbour today. One in our net, but too rough to take it out, yet' (B484/a/1-13).

18 Oct 1934: One white whale was taken from a seal net (B484/a/1-13).

2 Nov 1934: One white whale was taken from a seal net (B484/a/1-13).

5 Nov 1934: 'Natives report having seen many white whales near net' (B484/a/1-13).

6 Nov 1934: Two white whales were taken from the net (B484/a/1-13).

1 July 1938: 'White whales made their appearance this a.m. in front of the post' (B484/a/1-13).

APPENDIX 5. Accounts of belugas contained in Leaf River post journals, Hudson's Bay Company archives, from 1 August 1928 to 2 July 1938.

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1 Aug 1928: Three white whales were seen down the bay (B433/a/1-10).

29 Aug 1928: Many white whales were seen and two were killed (B433/a/1-10).

2 Oct 1928: Arrivals reported having seen a few hunting - most after numerous whales that were reported' (B433/a/1-10).

18 Oct 1928: Arrivals reported having seen a few whales up the bay (B433/a/1-10).

29 Aug 1930: Men left for Koakaluk looking for whales (B433/a/1-10).

27 Sept 1932: 'Two of the French Company men caught a white whale in a net made of salmon twine' (B433/a/1-10).

2 Oct 1932: 'Mosseapire came in with 1/2 of a white whale which he had caught in a net' (B433/a/1-10).

2 July 1938 'Three boats arrived from Kogulook returning from whale hunt. No sign of any whales' (B433/a/1-10).

APPENDIX 6. Accounts of belugas contained in Port Harrison post journals, Hudson's Bay Company archives, from 6 June 1921 to 12 July 1928.

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6 June 1921: 'Mayoviniciluk and Takiaglovuk bringing two whale nets' (B467/a/1-18).

11 June 1921: 'Sent Oomajualuk off with a crowd of Eskimo to the Nowlianik River where he will set some whale nets for the company.' 'R.J. Flaherty and party left for the Nowlianik River where he intends to take some moving pictures of the Eskimos harpooning white whales' (B467/a/1-18).

29 July 1921: 'We got one white whale in our whale nets today which is the first white whale ever caught in a net at Harrison' (B467/a/1-18).

31 July 1921: 'Mr. Flaherty reports that he was quite successful in getting several close up films of the Eskimo harpooning white whales' (B467/a/1-18).

9 Aug 1921: 'Oomajualuk arrived bringing the meat of one white whale and the hides of another - all of which were caught in the net the company loaned him' (B467/a/1-18).

10 July 1922: 'Put out whale net today although no whales have been seen around the post this spring' (B467/a/1-18).

31 May 1923: 'Outfit 253 has been a fairly good one for Prt. Harrison. 6 1/2 porpoise hides and 42 hair seal' (B467/a/1-18).

4 July 1923: 'A school of white whales was seen near Sheep Island...' (B467/a/1-18).

9 July 1923: 'A white whale was got from one of the trout nets today' (B467/a/1-18).

2 July 1923: 'Intended sending the Nonsuch about 20 miles south to bring back a whale net but wind prevented it' (B467/a/1-18).

7-22 Aug 1923: '3 white whales have been secured from our nets' (B467/a/1-18).

23 June 1924: 'Set out a whale net at the narrows' (B467/a/1-18).

2 July 1924: 'This afternoon a school of whales came up the river - killed 2 - one sunk' (B467/a/1-18).

4 July 1924: 'The white whale which sunk was found today' (B467/a/1-18).

21 July 1924: 'Nonsuch arrived today. Killed 2 white whales on the way home' (B467/a/1-18).

29 July 1925: 'One porpoise from whale nets to date' (B467/a/1-18).

19 July 1926: 'A few white whales were seen this afternoon between John's Point and Sheep Island - secured one' (B467/a/1-18).

10 Aug 1926: 'Secured one white whale from whale nets' (B467/a/1-18).

11 Oct 1926: 'Secured a fine white whale from whale nets' (B467/a/1-18).

12 July 1928: Arrivals traded three white whales (B467/a/1-18).

APPENDIX 7. Accounts of belugas contained in Povungnituk Bay post journals, Hudson's Bay Company archives, from 30 October 1923 to 3 September 1938.

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30 Oct 1923: Took in whale net (B468/a/1-10).

27 Aug 1927: 'The whale fishery at Povungnituk has not been as good as past years, Neenguusk having seen only 6. The late departure of the ice this year had a lot to do with this' (B468/a/1-10).

10 Oct 1927: 'Setting whale net out in one of the small bays near the post' (B468/a/1-10).

3 Sept 1938: 'There does not seem to be whales around here now' (B468/a/1-10).

APPENDIX 8. Accounts of belugas contained in Sugluk East post journals, Hudson's Bay Company archives, from 2 October 1925 to 5 July 1931.

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Oct 1925: There are accounts of six white whales being taken in nets between 2 October and 24 October (B485).

5 July 1931: 'Killed a whale today' (B485).

APPENDIX 9. Accounts of belugas contained in Whale River post journals, Hudson's Bay Company archives, from 21 June 1927 to 10 July 1928.

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21 June 1927: 'Got one whale opposite post' (B499/a/1-4).

25 June 1927: Left for whale fishery (B499/a/-1-4).

7 July 1927: 'Arrived back from whale fishery. We only managed to get three young white whales' (B499/a/1-4).

16 June 1928: 'Mr. J. Blackhall and Eskimos arrived back here today. Did not see any whales. They have not arrived there yet but probably will towards the last of this month or the first of next' (B499/a/1-4).

21 June 1928: 'Amercer and Harry Cooper getting ready for whale fishery. Saw a few whales up the river today. Harry reported that Mathew Sunnugnuk shot a large whale outside' (B499/a/1-4).

10 July 1928: 'Amercer and Eskimos arrived back from the whale fishery today although there was a few whales around they kept outside and all attempts to drive them was a failure and as the high tides are now over had to return without any whales' (B499/a/1-4).

APPENDIX 10. Accounts of belugas contained in Payne Bay post journals, Hudson's Bay Company archives, from 1930 to 1938.

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1930-1938: There are no accounts of white whales during this period. The concentration is upon seal hunting (B458/a/1-4).

APPENDIX 11. Accounts of belugas contained in Sugluk West post journals, Hudson's Bay Company archives, from 18 September 1930 to 23 July 1939.

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18 Sept 1930: 'Arrivals from the island say they saw a school of whales going south' (B486).

**4 July 1931:** 'Got a whale in net before we had finished setting it' (B486).

**11 July 1931:** 'Got a whale this afternoon in his whale net and his hunters shot 3.' 'There were 8 whales inside the inlet today and four out of the 8 were killed' (B486).

**July 1931:** There are accounts of three white whales being taken in nets between 12 July and 21

**27 Aug 1931:** Got a small whale, 'This is the third for the season' (B486).

**7 Oct 1931:** Three white whales were taken in a net (B486).

**6 Oct 1932:** Brought in a small whale caught in the net (B486).

**22 July 1933:** A white whales was killed (B486).

**15 July 1934:** 'A school of whales came into the Bay today. Nowlietook shot one' (B486).

**3 July 1935:** 'Eetook traded in another porpoise hide' (B486).

**23 July 1935:** A white whale was netted across the bay (B486).

**24 July 1935:** A white whale was killed (B486).

**25 June 1938:** One white whale was shot since the ice went out and although others were seen it was always too rough to go after them.

**7 July 1938:** A large school of white whales was seen. Two were caught in the bay.

**15 July 1938:** 'Shot a white whale yesterday.' 'White whales are not as numerous as they were last year' (B486).

**19 July 1938:** 'Two white whales seen from the post today but it seems that Ectoosalook didn't see them long enough to kill one although he managed to shoot away 16 cartridges at them' (B486).

**16 June 1939:** Kituk is reported to have shot a white whale (B486).

**8 July 1939:** 'No whales seen as yet by the native at the island' (B486).

**9 July 1939:** 'Ford caught 2 white whales in his net today. Arrivals from the island report that 7 white whales were shot yesterday' (B486).

**15 July 1939:** One white whale was shot (B486).

**23 July 1939:** 'Five white whales reported shot at the island yesterday, this is the first large school seen.'

APPENDIX 12. Accounts of belugas contained in Diana Bay post journals, Hudson's Bay Company archives, from 21 August 1938 to 18 February 1939.

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**21 Aug 1938:** 'Saw several white whales on the harbour' (B406/a/1).

**27 Aug 1938:** 'Only two whales have been caught at the whaling camp to date' (B406/a/1).

**29 Aug 1938:** 'Palliser in oil shed skinning and cutting up whale brought in by Nassal from nets' (B406/a/1).

**7 Nov 1938:** 'Tukkolik arrived from whaling camp. Report no seals or whales. The worst year ever' (B406/a/1).

**18 Feb 1939:** 'Alec arrived in with a piece of muktuk. He killed a whale at the flow yesterday' (B406/a/1).

APPENDIX 13. Accounts of belugas from the Port Harrison area (Wakeham Bay to Great Whale River) taken from RCMP 'G' Division Game Reports (Ta 1491-20).

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**1 July 1957 - 30 June 1958:** The white whale 1st appeared on July 25th 1957. Less were observed than the year before. 20 whales were taken by all agencies at or near the reporting point consisting of 12 adult males, 6 adult females, 1 young male and 1 young female. They last appeared on Sept 15 1957 traveling south.

**1 July 1958 - 30 June 1959:** The white whale 1st appeared on August 15th 1958. A greater number were observed than the year before. 26 whales were taken by all agencies at or near the reporting point consisting of 8 adult males, 6 adult female, 9 young males and 3 young females. They last appeared on Sept 30 1958 traveling south.

**23 July 1959:** 'White Whale - None in the immediate area although approximately 26 were taken during the year south along the coast. They also appear on the decrease.'

**1 July 1959 - 30 June 1960:** The white whale 1st appeared on July 30 1959. A greater number were observed than the year before. 55 whales were taken by all agencies at or near the reporting point consisting of 21 adult males, 18 adult females, 6 young males and 10 young females. They last appeared in Nov. 1959 traveling south.

**2 June 1960:** 'White whale - None in the immediate area and appear to be on increase, approximately 55 were taken during year.'

APPENDIX 14. Additional sightings of marine mammals at Cape Hopes Advance, 14 October–4 December 1980. Direction of movement is given as east (E), west (W) or unknown (O).

| | Bowhead Whale | | | Minke Whale | | | Ringed Seal | | | Bearded Seal | | | Harp Seal | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | E | W | O | E | W | O | E | W | O | E | W | O | E | W | O |
| 14 Oct | | | 1 | | | | | | | | | | | | |
| 16 " | | | | 2 | 2 | | | 1 | | 1 | | | | | |
| 17 " | 2 | | | 1 | 4 | | | | | | | | | | |
| 18 " | | | | 2 | | | | | | | | | | | |
| 19 " | | | | 4 | | | 1 | | | | | | 3 | | |
| 20 " | | | | 1 | | | | | 1 | | | | | | |
| 21 " | | | | 1 | | | | | 1 | | | | | | |
| 22 " | | | | | | | | | | | | | | | |
| 23 " | | | | | | | | | | | | | | | |
| 24 " | 1 | | | | | 1 | | | | 3 | | 1 | | | |
| 25 " | | | | | 4 | 2 | 2 | | | 1 | | | | | |
| 26 " | | | | | | | 1 | | | 2 | | | | | |
| 27[1] " | | | | | | | | | | | | | | | |
| 28 " | | | | | | | | | | | | | | | |
| 29 " | | | | | | | | | | | | | | | |
| 30 " | 1 | | | 2 | | | 3 | | | 6 | | | 18 | | |
| 31 " | | | | 2 | 4 | | 2 | | 1 | | | | 29 | | |
| 1 Nov | | | | 2 | | | | | | | | | | | |
| 2 " | | | | 1 | | | | | | 1 | | | | | |
| 3 " | | | | 1 | | | | | | 1 | | | | | |
| 4 " | | | | 2 | | | | | | 1 | | | | | |
| 5 " | | | | | | | | | | | | | | | |
| 6 " | | | | | | | | | | | | | | | |
| 7 " | | | | 2 | 1 | | | | | | | | | | |
| 8 " | | | | 1 | 2 | | | | | 1 | | | 9 | | |
| 9 " | 2 | | 1 | 2 | | 1 | | | | 1 | | | | | 13 |
| 10 " | | | | 1 | | | | | | 4 | | | 89 | | |
| 11 " | | | | | | | | | | | | | 23 | | |
| 12 " | | 1 | | 2 | | | | | | | | | | | 7 |
| 13 " | | | | | | | | | | | | | | | |
| 14 " | 1 | | | | 2 | | | | | | | | | | |
| 15 " | | | | 2 | 1 | 2 | | | | 1 | | | 5 | | |
| 16 " | | | 1 | 3 | 4 | | | | | 1 | | | 75 | | |
| 17 " | | | | | | | | | | | | | | | |
| 18 " | | | | | 2 | 1 | | | | | | | | | |
| 19 " | | | | 1 | | 2 | | 1 | | | | | | | |
| 20 " | 2 | | 2 | | | 2 | | | | 1 | | | | | |
| 21 " | 3 | | | | 1 | 1 | 1 | | 1 | | | | | | |
| 22 " | | | | | | | | | | | | | | | |
| 23 " | 2 | | 1 | | | | 1 | | | 1 | | | 1 | | 2 |
| 24 " | | | | | | | | | | | | | | | |
| 25 " | | | | | | | | | 1 | | | | | | |
| 26 " | | | | | | | | 1 | | | 1 | | 4 | | 1 |
| 27 " | | | | | | | | | | | | | | | 1 |
| 28 " | | | | | | | | | | | | | | | |
| 29 " | | | | | | | | | | | | | | | |
| 30[1] " | | | | | | | | | | | | | | | |
| 1 Dec | | | | | | | | | | | | | 4 | 1 | |
| 2 " | | | | | | | | | | 1 | | | | | |
| 3 " | | | | | | | | | | | | 1 | 1 | | |
| 4 " | | | 1 | | | | | | | 2 | | | 2 | | |
| Total | 14 | 1 | 7 | 34 | 27 | 12 | 11 | 3 | 5 | 29 | 1 | 2 | 263 | 1 | 24 |

[1] No watches conducted.

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